

European & Defence Security

€ 8.90
D 14974 E



4/2020

International Security and Defence Journal



COUNTRY FOCUS:
FRANCE



105 / 155mm Ammunition

- Pivot to Asia
- CBRN: Protecting the Population
- European Submarine Programmes
- Future Tactical UAS
- European Transport Helicopters
- Malaysia's Distracted Defence





LAZAR
MULTI-ROLE ARMORED VEHICLE



MILOSH
ARMoured MULTI-PURPOSE
COMBAT VEHICLE 4x4 - BOV M16



NORA B52
155 mm SELF – PROPELLED
GUN HOWITZER

Deep Mourning for Dr Peter Bossdorf

It is with great sadness that we have to report the sudden death of our Managing Director and Publishing Director Dr Peter Bossdorf, who passed away on 26 February 2020. Our deepest sympathies go to his wife and his family.

Dr Bossdorf joined Report Verlag in 2006, became its Publishing Director in 2007 and later was appointed Managing Director. In addition, he was Editor-in-Chief of the magazine "Strategie & Technik", which evolved from the traditional "Soldat und Technik" publication. As a result of the merger of Report Verlag with E.S. Mittler & Sohn publishing house, that created Mittler Report Verlag in 2012, the magazines "Strategie & Technik" and "Europäische Sicherheit" were combined under his leadership to form the current "Europäische Sicherheit & Technik". At the same time, Dr Bossdorf was appointed Managing Director of Mittler Report Verlag, where he also played a decisive role in the development of the English-language magazine "European Security & Defence" from a quarterly magazine to an internationally recognised specialist monthly journal. One year ago, Dr Bossdorf also took over the management of K&K Medienverlag-Hardthöhe GmbH as Publisher of the magazine "Hardthöhenkurier", so that he was most recently the highly valued Managing Director of two publishing houses as well as Editor-in-Chief of "European Security & Defence".



In Peter Bossdorf we have lost a positive, open-minded, knowledgeable, well-respected man; a good friend who was always attentive to and supportive of his colleagues and his many friends around the world.

The ESD Team

French Army Water-Crossing Resources

Photo: CNIM



The French Army has a wealth of national industrial capabilities on which to call.

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Arquus: A Good Year

Photo: Arquus



The diesel/electric SCARABÉE from Arquus is an excellent example of French initiative.

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■ Alcon Brakes for Patria

(ck) Finland and Latvia have together contracted Patria, a producer of armoured wheeled vehicles, to supply their 6x6 platform for a sustained mobility enhancement programme. Alcon Components Ltd, a specialist in brake and clutch systems, is the principal supplier of braking components for Patria's heavy armoured vehicle range, and specifically the PATRIA 6x6. Alcon has worked closely with Patria to determine the specific requirements aligned to vehicle specification, usage profiles and operating environment in developing a braking system appropriate for defence vehicles. As the performance of the Patria range of wheeled vehicles creates conditions similar to those of a rally car in terms of disc and pad temperature cycles, Alcon have been able to draw on their experience in providing braking solutions for motorsport to develop exclusive calliper and disc mounting concepts for Patria; a fusion of concepts seen in heavy duty vehicles and motorsport. The Patria 6x6 is a powerful armoured wheeled vehicle in-

Photo: Alcon

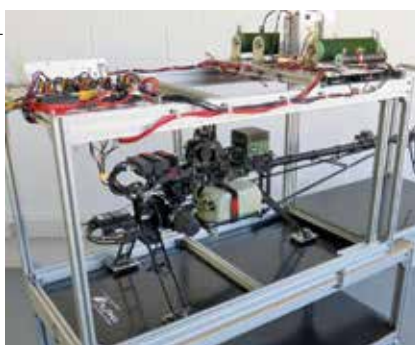


corporating many commercial components which offer long life and easy maintenance, making the vehicle very cost effective. This is in line with the Finno-Latvian programme's objective to develop an armoured wheeled vehicle system with improved mobility, cost efficiency, interoperability and security of supply. Alcon produces braking solutions for 18 different vehicle manufacturers in the defence industry. In addition, the designers of the JACKAL (BAE Systems, Ricardo and Jankel) have turned to Alcon to deliver tailor-made braking systems that meet the demands of the modern battlefield.

■ Test Bench for UAVs

(ck) Alpha Unmanned System, a Madrid-based manufacturer of UAV solutions, has started producing its High Accelerated Life-time Testing (HALT) solution. As testing is critical for flight reliability and safety, Alpha's engines and transmissions will be tested in "near-flight" environments for longer periods of time and in environments more similar to actual flight. This will improve fault identification which will result in more reliable platform design and manufacture. HALT

Photo: Alpha



will be used to define the maintenance periods of Alpha's new helicopter platform and, in addition, to execute the STANAG defined engine endurance tests and to fine-tune the fuel injection system. HALT will enable an increase in the testing hours that Alpha engineers can use to improve design and manufacturing. In order to test the complete helicopter, including the engine and transmission systems, Alpha has designed and manufactured its own test bench on which it will be able to test multiple engine and transmission loads in a controlled environment. The HALT will also simulate endurance and life cycle tests in "near-flight" conditions. Engine and transmission systems are especially critical for helicopter platforms. Since testing and validation exercises are time consuming and costly, and since industrial systems must be tested for thousands of cycles during development, Alpha expects to improve the airworthiness of its helicopter UAV platforms using HALT.

■ Turkey to Procure Domestic Armed Drones

(ck) ASISGUARD, a Turkish company developing systems, subsystems, hardware and software for military applications such as UAVs, have delivered the SONGAR armed drone to the Turkish Armed Forces (TAF) after the successful completion of acceptance tests. SONGAR will undertake critical tasks in operations conducted by both TAF and the security forces. Equipped with an automatic machine gun, SONGAR can carry out operations within a 3 km radius. The system can transfer images in real time and carry 200 rounds of 5.56x45mm NATO ammunition. The drone features a specially designed flexible ammunition feed chute (ammunition

Photo: ASISGUARD



belt) and an automatic firing mechanism, and can operate at altitudes of 2,800 metres. SONGAR has achieved success in field tests after the integration of a grenade launcher in place of the machine gun, and its firing precision has been improved with the inclusion of an "Electronic Sight and Ballistic Calculation Module", designed by ASISGUARD.

■ Bell V-280 VALOR to Continue in FLRAA Programme

(ck) Bell Textron has been selected for the competitive demonstration and risk reduction (CD&RR) effort as part of the US Army's Future Long Range Assault Aircraft (FLRAA) programme. Under the agreement, Bell will deliver a refined V-280 VALOR design, with supporting technical documentation, that

Photo: Textron



builds on the data captured during more than two years and 170 hours of flight testing under the Joint Multi-Role Technology Demonstration (JMR TD) programme to inform the FLRAA programme of record. This contract follows the successful US Army-led JMR TD programme. As part of that programme, Bell managed collaboration with the twelve leading companies that make up Team VALOR to enable rapid production, systems integration, and deliberate programme schedule to validate the V-280's flight capabilities and operational relevance. The V-280 achieved all programme goals, demonstrating its speed by flying above 300 knots and demonstrating low speed agility. These characteristics are important to inform FLRAA programme requirements to ensure the programme will help warfighters meet the challenges of future multi-domain fights. The V-280 VALOR was developed in support of the government Future Vertical Lift (FVL) programme, the Army's number three modernisation priority area. The FLRAA programme plans to produce a medium-lift utility rotorcraft replacement with transformational speed, power, and manoeuvrability, at a sustainable cost.

■ COYOTE Counter-Drone Weapon Approved for International Sales

(ck) The US government has cleared Raytheon to sell the COYOTE Block 2 counter-drone weapon to approved allied nations as

FNSS



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Photo: Raytheon

part of the HOWLER counter-drone system. In 2019, the US Army deployed HOWLER, a combination of the Ku-band Radio Frequency System and COYOTE Block 1, into the battlefield. The high-speed, highly manoeuvrable Block 2 is designed to use Raytheon's KuRFS multi-mission radar as its fire control source. "Delivering this enhanced version of the combat-proven COYOTE strengthens our allies' defences against enemy drones," said Sam Deneke, Raytheon Land Warfare Systems vice president. Raytheon recently completed developmental, operational and customer acceptance testing on the COYOTE Block 2 variant. Powered by a jet engine, the weapon can be launched from the ground to destroy drones and other aerial threats. Raytheon expects to achieve full-rate production in 2020.

■ Mortar Training Solution

(ck) An industry team led by D3A Defence has developed a virtual training system for mortar operations based on a mixed-reality virtual training environment that is easy to use and quick to deploy. The system consists of three networked training stations, one for Mortar Fire Controllers (MFC) and/or Forward Observers (FO), one for mortar/artillery Command Post (CP) operators and one for mortar crew, integrated to enable training for mortar operations within a joint training environment. The mixed-reality MFC station operator is equipped with in-service hardware representative binoculars and Laser Range Finders (LRFs) and a head-mounted display with visuals provided by MetaVR's Virtual Reality Scene Generator (VRSG). The trainees are immersed in a 360 degree, mixed-reality virtual world that allows them to interact with the vir-



Photo: D3A

tual world through VRSG while handling and operating hardware equipment in the real world. The MFC sends fire missions to the CP and mortar crew via emulated radios. The CP station represents the mortar or gun line CP enabling the management of fire orders, facilitated by a laptop running Battlespace Simulation Inc's (BSI's) Modern Air Combat Environment (MACE) integrated with VRSG. Together, they provide real-time ballistic information and replicate effects of fired ordnance accurately within the virtual environment. The mortar crew station features a physically representative mortar fitted with equipment provided by Minerva Simulation & Training. The mortar is integrated into the virtual environment so that firings are replicated in the virtual environment with accurate falls of shot. Designed to enable flexible, quick-deploy training capabilities for mortar operations, the solution can be packed and transported in a single two-man portable ruggedised case, with all the equipment needed to set-up and run training scenarios within minutes.

■ Keel-Laying Ceremony for Nigerian Landing Craft

(ck) On 9 December 2019, Damen Shipyards Sharjah in the UAE held a keel-lay-



Photo: Damen

ing ceremony for a landing craft for the Nigerian Navy, an LST 100. The start of the vessel's construction was attended by Nigeria's Chief of Naval Staff, Vice Admiral Ibok-Ete Ibas. Damen has designed the LST 100 for a range of duties including amphibious operations, strategic transport of equipment and troops, disaster relief, evacuation operations and humanitarian assistance. The 100 metre long roll-on-roll-off landing craft can accommodate a crew of 32 people and 16 Embarked Marine Forces (EMF) in the deckhouse. There is additional EMF accommodation for 234 pax at mid ship below main deck. The vessel has a helicopter/UAV deck and significant space for cargo, loaded with the stern ramp, bow ramp or 25 tons main crane. The LST 100 is scheduled for delivery in 2022.

■ DARPA Contracts for MANTA RAY Programme

(ck) DARPA's MANTA RAY programme aims to demonstrate critical technologies for new long range, payload-capable unmanned underwater vehicles (UUVs). UUVs that operate for extended durations without the need for on-site human logistics support or maintenance offer the potential for



Photo: DARPA

persistent operations during long-term deployments. DARPA has selected Lockheed Martin, Northrop Grumman and Navatek to focus on development of an integrated solution for MANTA RAY technology and operational areas. A fourth company, Metron Inc, will work toward critical technology and solutions specific to the field of undersea energy harvesting techniques at depths necessary for successful operations. The MANTA RAY programme aims to increase at-sea operational capacity and capabilities for the combatant commander while minimising disruptions to current operations by remaining independent of crewed vessels once deployed. The MANTA RAY programme plans to advance key technologies that will benefit future UUV designs, including: energy management and energy harvesting techniques at operationally relevant depths; low-power, high-efficiency propulsion; and new approaches to mitigate biofouling, corrosion, and other material degradation for long duration missions.

■ Radomes for MQ-9B

(ck) General Atomics Aeronautical Systems will cooperate with Belgium-based Soci t  Anonyme Belge de Constructions A ronautiques (SABCA) to supply Satellite Communications (SATCOM) radomes for the MQ-9B SkyGuardian and SeaGuardian Remotely Piloted Aircraft (RPA). SABCA is one of GA-ASI's team of Belgian suppliers – known as Team SkyGuardian Belgium – that will be



Photo: General Atomics

providing content for all MQ-9B aircraft. The Government of Belgium has approved Belgian Defence to negotiate the acquisition of MQ-9B to meet the nation's RPA requirements. The ABCA radomes are a complex, major component of the MQ-9B airframe. After being qualified by GA-ASI in 2019, SABCA has been awarded the production of the lightning-protected SATCOM radome for the worldwide fleet of MQ-9B. The production of the first radome will start in 2020 in SABCA's Limburg facilities in Belgium.

■ Radar Technology for Korean Navy

(ck) Hanwha Systems, a South Korean defence company, has selected Cambridge Pixel, a developer of radar display, tracking and recording sub-systems, to supply its advanced SPx radar technology for installation on the Korean Navy's fleet of CHAMSURI II class patrol boats and FFX-II frigates. Engineers at Hanwha Systems in South Korea needed field-proven radar processing components – including radar acquisition, radar display, radar scan conversion, radar distribution and radar recording – for the development of the latest multi-function display console, the FFX-B2. It was vital that



Photo: Hanwha

the software modules provided by Cambridge Pixel could be built into Hanwha's own application code thereby enabling Hanwha's development team to deliver a native solution to the Korean Navy which can be supported locally. Cambridge Pixel will supply Hanwha Systems with radar interfacing and distribution capability for different radar types, along with software for radar scan conversion, network distribution and multi-channel radar recording. Each FFX-B2 display console will be equipped with Cambridge Pixel's radar scan conversion software to convert the polar format network data into a PPI image, which is presented with application graphics as part of the multi-function console display. By using Cambridge Pixel's off-the-shelf SPx radar components, Hanwha Systems will reduce the development time for its new console and save money. CHAMSURI II class (project name PKX-B) patrol boats are a new,

smaller class (230-tons) of patrol boats intended to replace the ageing CHAMSURI class vessels built for the navy in the 1970s. SPx is Cambridge Pixel's integrated radar processing and display software based on COTS software and Open Standards. The SPx suite of software libraries and applications provides highly flexible, ready-to-run software products for radar scan conversion, visualisation, radar video distribution, target tracking, sensor fusion, plot extraction and clutter processing. Cambridge Pixel's radar technology is used in naval, air traffic control, vessel traffic, commercial shipping, security, surveillance and airborne radar applications.

■ Counter-Drone Solutions for Airports

(ck) Frequentis, an Air Traffic Management (ATM) solution provider, and sensor designer HENSOLDT are cooperating to create new integrated counter unmanned aerial vehicle (UAV) solutions. The two companies are already cooperating on the FALKE research project, which aims to develop the ability to intercept small UAV that enter restricted airspace at airports. The integrated solution will enable airports to deal with incidents such as those that took place at British airport Gatwick and German airport Frankfurt. Hamburg Airport will be the model for the resulting blueprint solution, with the partners demonstrating a technical and organisational concept to defend against illegally operating drones. Frequentis is providing mature components in UTM/ATM/drone detection, data fusion and exchange (MosaIX SWIM), shared situational awareness and ATM-grade surveillance data automation (SDDS-NG, MSDF, PRISMA), cross-agency incident management (ICM), as well as operational requirement analysis (Control Room Consulting). HENSOLDT will provide detection, identification and mitigation modules from their own Xpeller CUAV system. In addition to Frequentis and HENSOLDT, the FALKE project consortium includes the German Federal Police, German Air Traffic Control (DFS), Lufthansa, Hamburg Airport, and the chair of electrical measurement of the Helmut Schmidt University (HSU) in Hamburg. The project has begun with the creation of a demonstrator system integrating both Frequentis and HENSOLDT systems.

■ IAI Collaboration with Startup Accelerator

(ck) ELTA Systems, a division of Israel Aerospace Industries (IAI), is partnering with the international startup accelerator MassChallenge office in Israel in offering an



Photo: IAI

acceleration programme for Future Sensing companies. MassChallenge is a non-profit accelerator that offers its programmes, with no holdings or profit from the programmes it runs, for entrepreneurs and startups. The Future Sensing programme targets startups that develop high-frequency sensors, quantum computing, photonics, acoustics, ultrasonic, and other disruptive sensory or sensory datafusion technologies. ELTA offers the participating startups significant support, including access to customers and global markets in which ELTA is present, and the option to be integrated with ELTA's airborne intelligence, cyber, ground and air defence, and space systems. This first-of-its-kind collaboration embodies IAI's strategy to expand its global innovation partnerships with startups involved in sensory technologies. As a part of the collaboration with MassChallenge, ELTA will be involved in the selection process of the startups that will participate in the Future Sensing programme and review the startups that have already joined MassChallenge. The identification of innovative technologies that are relevant for IAI needs will contribute to future growth. The accelerator programme includes mentoring, joint development and business collaborations.

■ Amphibious Platforms for US Marine Corps

(ck) The contract for the new generation of Amphibious Combat Vehicles (ACV) for the US Marine Corps was originally awarded in 2018 and now the US Marine Corps has contracted BAE Systems, along with teammate Iveco Defence Vehicles, to deliver an additional 26 Amphibious Combat Vehicles (ACV) under the Low-Rate Initial Production (LRIP) phase of the programme.

This award brings the total vehicle orders for the ACV to 116, and moves the



Photo: Iveco

programme closer to full-rate production. The ACV is an advanced 8x8 open ocean-capable vehicle that is equipped with a six-cylinder, 700hp engine, which provides a significant power increase over the legacy fleet currently in service. The vehicle delivers best-in-class mobility in all terrains and has a suspended interior seat structure for 13 embarked Marines, blast-mitigating positions for a crew of three, and improved survivability and force protection over currently fielded systems. Current low-rate production is focused on the ACV-P variant. Further special variants will be added under full rate production within the ACV Family of Vehicles programme. Iveco Defence Vehicles and BAE Systems previously received the Lot 1, Lot 2 and Lot 3 awards. The companies and the US Marine Corps have been making significant strides to reach full-rate production, including the successful completion of Logistics Demonstration as a critical enabler for the programme to move into Initial Operational Test and Evaluation (IOT&E) with trained US Marine maintainers. This and other major milestones such as operator training and additional testing will take place before full-rate production.

■ Precision Rangefinders for US Army

(ck) L3Harris Technologies delivered the 3,000th STORM-SLX precision rangefinder to the US Army earlier this year. In 2019, L3Harris received a seven-year,



Photo: L3 Harris

US\$215M contract from the US Army for STORM 2. The Small Tactical Optical Rifle-Mounted laser rangefinder system, with extended performance over its predecessor, the STORM-PI, is the smallest US Army qualified weapon-mounted laser rangefinder available to the dismounted soldier and is part of the L3Harris STORM family of precision targeting systems. The STORM family is the only US Army qualified laser rangefinder available for the dismounted soldier. The company has delivered more than 17,000 STORM precision targeting systems over the last 15 years.

■ Schiebel CAMCOPTER Succeeds in Sniffer Test

(ck) Schiebel, together with partner Nordic Unmanned, have successfully completed a two-day test of sniffer capability on board the CAMCOPTER S-100 Vertical Take-off and Landing (VTOL) UAS in the shipping lane outside Griben, Denmark. Ships operating in Europe's busiest sea routes are permitted to emit exhaust fumes with a sulphur oxide content limited to no more than 0.1%. Amongst other solutions that have been put in place to



Photo: Schiebel

enforce this International Maritime Organisation (IMO) 2020 regulation, one option is to use Unmanned Air Systems (UAS), such as the CAMCOPTER S-100, equipped with a sulphur sniffer. The UAS flies through the ship's exhaust plume to measure the sulphur emissions and uses its Automatic Identification System (AIS) to identify the ships. The CAMCOPTER performed two successful flights of about four hours during the trial and provided compliant measurements of sulphur emissions. The certified sniffer provides live readings of the sulphur level in the ship's exhaust plume. In addition to the sulphur sniffer and the AIS, the CAMCOPTER was equipped with an L3 Harris WESCAM MX-10 real-time Electro-Optical/Infra-Red (EO/IR) camera. Commenting on the CAMCOPTER test, Knut Roar Wiig, CEO at Nordic Unmanned said: "If a ship is not following the regulations, we will definitely sniff it out."

■ MTU to Become F138 Engine Depot for USAF

(ck) MTU Maintenance Canada Ltd, MTU's stronghold and competence centre for military engine maintenance, will support the United States Air Force's (USAF) F138 engines and components with depot maintenance, repair and overhaul. The contract is currently valued at US\$225M and will run for ten years until February 2030. The F138 is the military variant of the CF6-80C2 engine



Photo: MTU

and powers the C-5M SUPER GALAXY - the largest aircraft in the USAF inventory - with four of these engines. The CF6-80C2 programme was recently introduced at MTU Maintenance Canada, with the first engine inducted in early 2020 and test cell correlation currently underway. The first F138 US-AF delivery order is expected in April 2020.

■ First-Ever Equipment Contract from Bundeswehr for Nexter

(ck) On 2 March 2020, the German procurement authority BAAINBw contracted Nexter to deliver 7 P20 assemblies. The P20 is a pintle-mounted system equipped with 20mm cannon which can be used to arm all types of light 4x4 vehicles. It is suited for ground-to-ground and ground-to-air close fire support, urban combat, protection, or self-defence missions. This assembly uses the 20M621 gas-operated gun designed by Nexter's teams in Bourges. It is renowned for its ease of use, and fires 20x102 ammunition to NATO or M50 standards. The P20 is an entry-level manual solution that provides the explosive and armour-piercing power of the 20mm calibre. This is why



Photo: Nexter

the BAAINBw has chosen the P20 to carry out a first experiment in Germany. Two complementary consultations are expected in the near future: a call for tender for 20x102 ammunition and a second contract by 2021-2022 for additional P20 guns for the German Special Forces. This contract is a major first for Nexter, as it is the first equipment contract for the Bundeswehr signed by the group. In this campaign, Nexter has benefited from the assistance of Krauss-Maffei-Wegmann (KMW), its partner in KNDS, which was able to support the Nexter teams in charge of the offer throughout the public consultation and negotiations.

■ Rheinmetall to Modernise NH90 Flight Simulators

(ck) Rheinmetall is modernising the NH90 helicopter flight simulators for the German Army Aviation Corps. A contract to this effect was signed in December 2019.



Photo: Rheinmetall

The order is worth a figure in the lower double-digit Euro million range. The contract encompasses operation, service and maintenance of the simulators through to 2027, with a contractually guaranteed availability rate of at least 98%. The German Bundeswehr is thus sticking to HFTS GmbH, the tried-and-tested operator of its NH90 simulators. HFTS GmbH is a consortium in which Airbus Helicopters, CAE, Rheinmetall and Thales each hold an equal share. Founded in 2004, HFTS today operates NH90 full-mission simulators in Bückeburg, Fassberg and Holzdorf. The modernisation project involves updating the system to match the current configuration of the NH90 (MR1) as well as qualification of the four simulators

in accordance with EASA licensing regulations, Level C. Rheinmetall has expertise with NH90 simulators. In addition to flight simulators, the Group has already supplied several systems for training NH90 ground personnel. In mid-2019, an ASTERION-based system of this type for the NH90-NTH naval helicopter went into operation at Nordholz Naval Air Base. Before this, ground crew training systems had already been supplied to Fassberg. Here, German Army ground personnel are schooled in operating and maintenance procedures for the NH90 TTH in exact replicas of the cockpit.

■ Micro-Drones for Swiss Army

(ck) Parrot has been chosen to equip the Swiss Armed Forces with microdrones as part of the "Swiss Mini UAV Programme" (Swiss MUAS) call for tender against major civilian UAV players. Parrot's expertise in professional drones and its ability to meet the high level of cyber security required by the Swiss armed forces were decisive factors in the choice. The tender, launched at the beginning of 2019 by armasuisse, the Swiss procurement agency, was designed to



Photo: Parrot

get cost-effective training aids to enable the troops to become familiar with Mini UAV operations. Mini UAVs can significantly enhance the safety of the troops. They are easily deployed thanks to the high-performance, light and evolving drones developed by Parrot. Product specifications, quantities and prices have not been disclosed. Although the financial impact of this project will not be significant in terms of the Parrot Group's results, this contract adds up to the development contract signed with the US Army in May 2019 for the new generation of compact drones, dedicated to the surveillance of the SRR (Short Range Reconnaissance) programme.



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AMMUNITION

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**.



EQUIPMENT



**ARTILLERY
SYSTEMS**

Pivot to Asia: The Indo-Pacific

Suman Sharma

The Indian-Pacific region and Indian Ocean could be the future battlefield between India and China. The importance of the region and its strategic geography could make it a contested area.

In his keynote address at the Shangri La Dialogue in Singapore on 1 June 2018, Indian Prime Minister Narendra Modi outlined the concept of the Indo-Pacific by saying it would "stretch from the shore of east Africa to the shores of the Americas." A month earlier, the US renamed its important strategic Command based outside Honolulu, Hawaii from Pacific Command to US Indo-Pacific Command, which is the unified operational Command of the US armed forces, responsible for the Indo-Pacific region. From then on, the Indo-Pacific has gone from being a piece of strategic geography to a global 'battleground' and as well as a 'state of mind'.

The Indo-Pacific region, which is primarily a maritime littoral region, encompasses 36 countries across 16 time zones and 24 out of the 36 megacities on Earth and is home to more than half the world's total population. It covers more than half the world's surface area. The contentious region encompasses three of the world's largest economies, seven of the largest militaries, and five of the US's seven mutual defence agreement partners. More than 90% of the world trade passes through this region, making it even more strategic. According to former US Indo-Pacific Command Commander Admiral Harry B. Harris Jr., "roughly US\$5.3Tr in annual global trade relies on unimpeded access to sea lanes such as those in the Straits of Malacca and the South China Sea, and US\$1.2Tr of this sea-based trade destined to, or exported from, the United States." Moreover, "the Strait of Malacca alone sees more than 25% of oil shipments and 50% of all natural gas transits each day", Harris continued. In addition, the area is disaster-prone, with typhoons, earthquakes, volcanoes, tsunamis, and other

Photo: USMC



US Marines and Malaysian troops use smoke to obscure their movements during an exercise in Tanduo Beach, Malaysia.

events representing over 60% of the world's natural disasters. To sum it up, global prosperity hinges on the stability and security of this vast and complex region. Former Indian Prime Minister Dr Manmohan Singh said on 23 May 2018, "We live in a difficult neighbourhood, which holds the full range of conventional, strategic and non-traditional challenges. Our defence cooperation has grown and today we have unprecedented access to high technology capital and partnerships. We have also sought to assume our responsibility for stability in the Indian Ocean Region. We are well positioned, therefore, to become a net provider of security in our immediate region and beyond."

From California to Kilimanjaro

In January 2020, at the annual foreign policy conference of the Raisina Dialogue in New Delhi, the US Deputy National Security Advisor, Matthew Pottinger, responded to Russian Foreign Minister Sergei Lavrov's objections to the renaming of the Asia-Pacific region as the Indo-Pacific that the term 'Indo-Pacific' would include the east coast of Africa. However, Minis-

ter Lavrov believed that the US's intention to rename the region, something other countries have followed suit, was likely to serve the purpose of containing one country, namely China.

At this conference, former Indian Foreign Minister Vijay Gokhale said that, "Asia-Pacific was non-inclusive and sounded more colonial, while Indo-Pacific was more inclusive and more global." However, both the US and India defended the new term by saying that it was not aimed at containing any country.

Given the central importance of the Gulf for India's energy security, its connectivity projects, and the fact that the region is a major source of migrant workers, this recalibration of the US concept ('from California to Kilimanjaro') is a belated recognition of the strategic importance of the Northwest Indian Ocean region, in contrast to the earlier narrative that the Indo-Pacific extends from Hollywood to Bollywood, as articulated by Admiral Harris.

The Quad

At the 2019 Raisina Dialogue, admirals from Australia, India, Japan and US Navy appeared together on one stage for

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Defence Beyond Expectations



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the first time. The four admirals - the Australian and Indian naval chiefs, the head of the then US PACOM (renamed INDOPACOM in May 2018) and the head of the Japanese Self-Defence Forces at Sea - all stood shoulder to shoulder and signalled that the 'Quad' was indeed a military-maritime security grouping. Australian Prime Minister Scott Morrison said in his address at the APEC CEO Summit on 17 November 2018, "We want a rules-based system that respects the sovereignty and the independence of

cific. However, global powers like the US tend to see India as a counterweight to China, which has given this idea a naval dimension. During his recent visit to India, President Donald Trump spoke of India's increasing role in South Asia. President Trump also said that, "The Indo-Pacific should be an inclusive, free and open zone with freedom of the seas and overflight." The US is also aiming to oversee India's rise as a regional power and goods provider and, ultimately, a partner to the US

the concept and praised India's efforts as an important actor in this geopolitical construct. Former US Secretary of State Hillary Clinton had also praised India's role in the region, which was not well received in Beijing. Moreover, after President Trump's clear statement, China has become even more wary.

China's assertion of territorial claims over South China and East China seas have sparked disputes with most of its neighbours like Japan, Malaysia, Vietnam, Philippines, Taiwan, and Brunei, along with some ASEAN countries, such as Cambodia, Indonesia, Laos, Myanmar, Singapore and Thailand. The main dispute is over the various island structures constructed by China, which could provide a strategic launchpad for resources extending up to 200 nautical miles from the shore.

Although neither China nor US is a member of ASEAN, both have supporters in the Association, for example, Cambodia, which is a staunch ally of Beijing and who has campaigned against the internationalization of the South China Sea issue, which was opposed by the Philippines, Vietnam, Brunei, Indonesia and Singapore.

Russia

During the second Indo-US 2+2 in 2019, Indian Foreign Minister Jaishankar said: "The Indian-Pacific region is for something, not against someone. And that something is peace, security, stability, prosperity and rules". Later, during Prime Minister Modi's visit to Vladivostok on the occasion of the Eastern Economic Forum and during the 2019 G-20 summit in Osaka, Russia, China and India met to discuss the 'Indo-Pacific' issue.

Strategic Convergence in the Indo-Pacific

According to the Joint Statement released during President Trump's visit to India, "A close partnership between India and the United States is central to a free, open, inclusive, peaceful and prosperous Indo-Pacific region. This cooperation is underpinned by recognition of ASEAN centrality; adherence to international law and good governance; support for safety and freedom of navigation, overflight and other lawful uses of the seas; and unimpeded lawful commerce; and advocacy for peaceful resolution of maritime disputes in accordance with international law."

The Statement further read, "The United States appreciates India's role as a net provider of security, as well



Photo: White House Photo by Shealah Craighead

On 22 September 2019, President Trump and Prime Minister Modi met at a rally in honor of Prime Minister Modi in Houston, Texas. The US increasingly honour India's role as a net provider of security in the Indo-Pacific region.

every single country and a commitment to regional security which is always the precondition for prosperity."

The US and Japan have not only endorsed the Indian concept, but have also openly expressed their support for it. Although their vision was more military in nature, India tends to describe the region as an economic area. India's strategy for the Indo-Pacific region confirms the central role of Association of Southeast Asian Nations (ASEAN), even though the US wanted to establish India as a strategic partner in the Indo-Pacific after the Cold War.

On 22 January 2018, Japanese Prime Minister Shinzo Abe said, "We must ensure that these waters are a public good that bring peace and prosperity to all people without discrimination into the future."

The geopolitical idea that India follows is that the Indian Ocean is, by and large, a single entity through its connection to the East China Sea and the Western Pa-

to 'share the burden' with India by reducing 'the strain on US forces' deployed in the Western Pacific.

Other countries also have similar orientations to India. France, for example, has its Indo-Pacific concept, which extends from the east coast of Africa to French Polynesia. The UK and Australia follow the same concept as India, while the US and Japan also focus on India, with their concept of the Indo-Pacific extending from Guam to the east coast of Africa.

During a visit to Australia on 2 May 2018, French President Emmanuel Macron said, "Now what is important is to preserve a rules-based development in the region. It is to preserve the necessary balance in the region."

China

China has been rather cautious about the term 'Indo-Pacific' since the US endorsed

as developmental and humanitarian assistance in the Indian Ocean Region. India and the United States remain committed to sustainable, transparent, quality infrastructure development in the region". Prime Minister Modi and President Trump welcomed the US International Development Finance Corporation (DFC) announcement of a US\$600M financing facility for renewable energy projects in India, and the DFC's decision to establish a permanent presence in India this year.

Taking note of their countries' shared commitment to advancing effective development solutions in the Indo-Pacific and globally, "Prime Minister Modi and President Trump look forward to a new partnership between USAID and India's Development Partnership Administration for cooperation in third countries."

India and the US took note of efforts towards a meaningful Code of Conduct in the South China Sea and solemnly urged that it would not preclude the legitimate rights and interests of all countries according to international law.

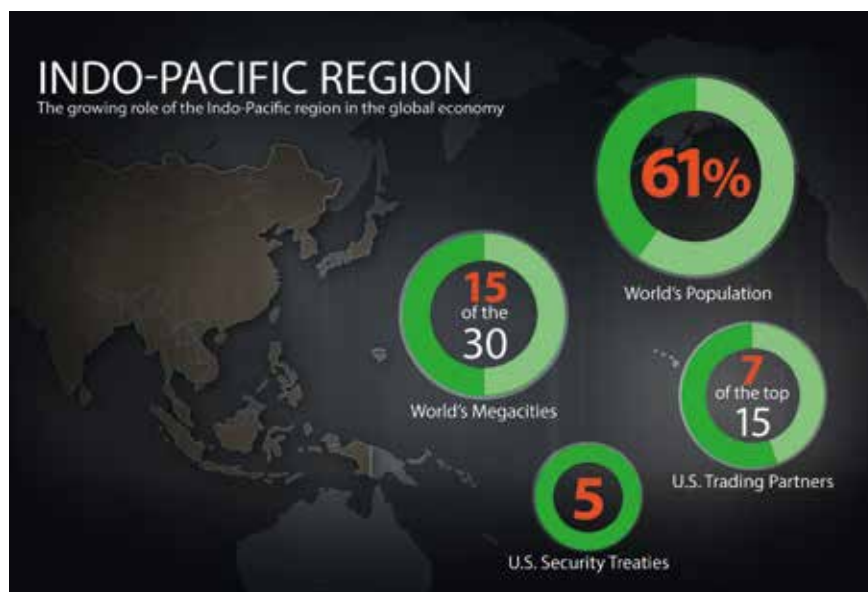
Prime Minister Modi and President Trump decided to strengthen consultation through the India-US-Japan trilateral summits, the 2+2 Ministerial meeting mechanism of the Foreign and Defence Ministers of India and the United States, and the India-US-Australia-Japan Quadrilateral consultations, among others. The statement read, "Prime Minister Modi and President Trump look forward to enhanced maritime domain awareness sharing among the United States, India, and other partners".

Anil Wadhwa, a retired diplomat from the Indian Ministry of External Affairs, said about the Indo-Pacific that, "Indonesia calls this concept as Indo-Pacific Treaty of Friendship and Cooperation, Japan calls it the Confluence of the Two Seas, Australia calls it as the Two Ocean Theory, China calls it as the Maritime Silk Road, India calls it as its Act East Policy, but it is all the same. Different countries have a different name for the same thing depending on their interests".

During his recent visit to India, the Deputy Prime Minister of New Zealand, Winston Peters, said, "The Indo-Pacific should be open and inclusive and should follow international law and freedom of navigation and overflight with ASEAN Centrality".

ASEAN

The ASEAN is headquartered in Indonesia and has 10 member states, which are Brunei, Cambodia, Indonesia, Laos,



The Indo-Pacific region has the world's highest growth potential.

Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam. ASEAN's take on the Indo-Pacific states that it is "based on the principles of strengthening ASEAN Centrality, openness, transparency, inclusivity, a rules-based framework, good governance, respect for sovereignty, non-intervention, complementarity with existing cooperation frameworks, equality, mutual respect, mutual trust, mutual benefit and respect for international law".

Other Groupings

The Regional Comprehensive Economic Partnership (RCEP) is a proposed free trade agreement in the Indian-Pacific region, whose member states are South Korea, Japan, China, New Zealand, Australia and India. India withdrew from the RCEP in November 2019 when it was sign, due to the lack of transparency and fairness of the agreement. The Trans-Pacific Partnership is a trade agreement between Australia, New Zealand, Brunei, Canada, Chile, Japan, Vietnam, Singapore, Peru, Malaysia, Mexico and US, from which the US withdrew in January 2017.

The Blue Dot Initiative is a multi-stakeholder initiative, which brings together governments, the private sector, and civil society under shared standards for global infrastructure development. India and the US hold that, to contain the build-up of sovereign debt in developing and low-income countries, it is important to ensure responsible, transparent, and sustainable financing practices for borrowers and creditors. Prime Minister Modi and President Trump expressed

interest in the concept of the Blue Dot Network. It is widely believed by strategic observers that this Initiative is basically to counter China's Belt and Road Initiative (BRI), which is making China uneasy.

The Chinese-led Belt and Road Initiative (BRI), which began in 2013, involves infrastructure development and investments in almost 70 countries spreading across Europe, Asia and Africa.

Although most groupings have an economic and security aspect and are mostly focused on ASEAN countries, with India being a direct member in some cases and a partner in others, it is clear that India is at the centre of the Indian-Pacific region because of its size, military capabilities and economic size. China cooperates economically with almost all countries in the Indian Ocean region and is working more closely with all ASEAN countries, and given its growing footprint in the BRI, strategists often conclude that these Chinese actions are largely a counterbalance to Indian activities with its Western partners in the Indo-Pacific region.

Commenting on the Indo-Chinese rivalry, strategic analyst Commodore (ret.) Uday Bhaskar said that, "Two China-related strands form the larger background against which the plight of the navy can be explained." China is the primary referent for the US-India partnership in the emerging strategic environment of the Indo-Pacific. Referring to the relative growth profiles of the Chinese and Indian navies, Indian Naval Chief Admiral Karambir Singh said, "They are doing what they have to do and moving at the pace they are capable of. We will move at the pace that we are capable of."

Photo: US Air Force



The US-organised 2019 Pacific Air Chief Symposium hosted an unprecedented number of air Chiefs from across the Indo-Pacific. The event, which echoed increasing US interest in the region, was under the theme 'A Collaborative Approach to Regional Security'.

The first strand referred to above pertains of Chinese footprint in the Indian Ocean Region (IOR) and the rapid growth of the Peoples Liberation Army Navy (PLAN) over the last decade. This includes the historic anti-piracy operations of the PLAN in December 2008 when

PLAN ships entered the Indian Ocean for the first time in the modern period, to the establishment of the first overseas Chinese military base in Djibouti, in the Horn of Africa, and supplying two submarines to Bangladesh. The Chinese naval presence in the IOR and China's engagement with the IOR littoral states is steadily increasing, which is supplemented by the more ambitious BRI that has the personal imprimatur of Chinese President Xi Jinping.

Thus, the Indian Navy will have to ensure that the visible and steadily increasing PLAN presence in the IOR does not adversely impact core national interests. Reports about a Chinese research vessel possibly gathering oceanographic data in the waters off the Andaman and Nicobar Islands and having to be encouraged to leave by the Indian Navy is illustrative of such exigencies that could arise in the future.

The Multi-Domain Battle Concept

The multi-domain battle concept may at first sound like nothing more than traditional joint training exercises. The trilateral maritime exercise 'Malabar' with the navies of US, India and Japan is a great example. While Australia has been waiting for an invitation to participate in 'Malabar', bilaterally the Australian Navy conducts exercises with India and other countries in the Indian Ocean region.

For the multi-domain battle concept, which forms the basis for non-combat warfare, along with artificial intelligence, cyberspace and the space forces command, it is essential that all services unite under a common operational command. This cross-domain integration of all services is designed to deliver optimal results in a combat scenario.

The emerging underwater threats to countries have compelled littoral states in the Indian Ocean Region to escalate their surveillance efforts in the underwater domain. While there are only six countries (US, Russia, China, India, UK and France), have nuclear-powered submarines which can stay underwater for extended periods, other countries make use of conventional submarines with sonars, and other soft acoustic capabilities. Equipment can be a force multiplier. All ASEAN countries have conventional diesel-electric submarines, which are either of Russian, German or French origin. The geopolitically unsettled and divided Indian Ocean Region, posing threats, only outlines India's enhanced role in the emerging Indo-Pacific security architecture.

The US Indo-Pacific Strategy Report

In its 'Indo-Pacific Strategy Report: Preparedness, Partnerships, and Promoting a Networked Region', dated 1 June 2019, former US Secretary of Defence James Mattis said, "The Indo-Pacific is the Department of Defence's priority theatre. The US is a Pacific nation; we are linked to our Indo-Pacific neighbours through unbreakable bonds of shared history, culture, commerce, and values. The continuity of our shared strategic vision is uninterrupted despite an increasingly complex security environment. Interstate strategic competition, defined by geopolitical rivalry between free and repressive world order visions, is the primary concern for US national security. In particular, the People's Republic of China, under the leadership of the Chinese Communist Party, seeks to reorder the

Photo: US DoD



region to its advantage by leveraging military modernisation, influence operations, and predatory economics to coerce other nations."

In its 'Strategy Report', the US Army Pacific has mentioned that it would like to attempt joint integration through flexible and custom-made command and control agencies, and flexible policies in key areas. The US Navy conducts a joint multilateral Rim of the Pacific (RimPac) exercise so as to cross-exercise-component, combatant-command procedures.

This report also stresses the importance of technology, which includes rapid material supplies with strategic capabilities.

On 12 February 2019, before the Senate Armed Services Committee, Admiral Philip S. Davidson, Commander of the US Indo-Pacific Command, stated "Beijing is leveraging its economic instrument of power in ways that can undermine the autonomy of countries across the region ... easy money in the short term, but these funds come with strings attached: unsustainable debt, decreased transparency, restrictions on market economies, and the potential loss of control of natural resources."

The Multi-Domain Battle in a Real Scenario

If a coastal land area is taken by a hostile country and other countries were denied access to sea and airspace, this would destabilise the situation and thus pose a threat to the Indo-Asian Pacific region. To adequately respond to such a situation, the defender would use cyber and space to jam the enemy's electronic capabilities and dismantle the enemy's control and command systems. This operation would be successful through amphibious elements of the navy and the army, while search and reconnaissance would be carried out by air power to secure defences by using large transport airlifters like C-17 GLOBEMASTERS and C-130s carrying Army STRYKER battalion task force with a High-Mobility Artillery Rocket System (HIMARS) battery, Army radar systems and other specialised equipment like anti-ship cruise missiles, Howitzers, air defence, and attack cruise missiles.

Joint training and changing doctrines have made such operations possible, along with high-tech technology. India is progressing towards new joint theatre commands and regularly conducts exercises with all neighbouring maritime countries.

The Importance of India

The strategic Straits are Malacca, Sunda, Lombok, Ombai and Wetar Straits. The Ombai-Wetar Straits, which is located in the south-east of Indonesia has the deepest waters, which is conducive for a nuclear-powered submarine to sail submerged. In order to detect such submarines, it is imperative that India has a foothold in this area, as Chinese nuclear submarines pass-by this Strait. Earlier also these submarines have been detected in this region. Therefore, India conducts military exercises with Indonesia and has a defence cooperation, so as to have a footprint in these waters.

Retired Indian Naval officer Vice Admiral Pradeep Chauhan of National Maritime Foundation said about the Indian Ocean as being the next theatre of war between India and China, "As the geographic competition-space between India and China coincides in the Indian Ocean, this is certainly the most likely area of confrontation and possible conflict." ■

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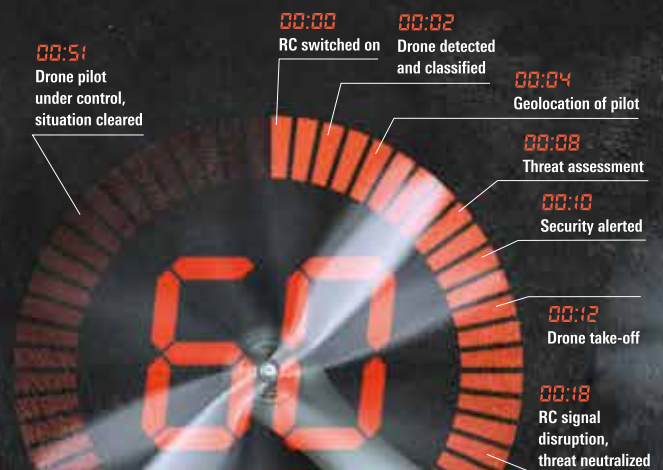


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The Shanghai Cooperation Organisation

Can it Stabilise 'Greater Central Asia'?



Gayane Novikova

The Declaration of Establishment of the Shanghai Cooperation Organisation (SCO) mentions as its main goals "strengthening mutual trust, friendship and good neighbourliness between the member states; encouraging effective cooperation between them in the political, trade, economic, scientific, technical, cultural, educational, energy, transport, environmental and other fields; making joint efforts to maintain and ensure peace, security and stability in the region and establishing new, democratic, just and rational international political and economic order."

A Few Preliminary Remarks

This analysis will concentrate on some issues related to the maintenance of security and stability. However, before analysing the potential of the SCO, a few preliminary remarks are necessary.

Established in 2001 by Russia, China, Kazakhstan, Uzbekistan, Tajikistan, and Kyrgyzstan, the SCO was enlarged in 2017 with the inclusion of India and Pakistan as full members. Four other states – Iran, Afghanistan, Mongolia, and Belarus – have observer status. With some reservations, 'Greater Central Asia' will be utilised to refer to the SCO area. The SCO member states interact more successfully on the bilateral, than on the multilateral level. Four SCO members – Russia, China, India, and Pakistan – belong to the world's 'Nuclear Club'. Iran is in the process of building its nuclear capacities. China and Russia (India is not yet very active in this structure), based upon their own strategic goals, prefer to consider the so-called 'Greater Central Asia' area exclusively as a platform for cooperation. This approach provides to them more economic benefits and allows to minimise existing contradictions. However, it does not exclude their competition in order to acquire more economic and political influence, and to



International High-Level Delegates at the 2015 Summit of the Shanghai Cooperation Organisation

strengthen their strategic positions in this area.

The differences across member states in terms of their territory, population, economic potential, and military might, are significant. The most powerful members of the SCO – China and Russia – act aggressively, using also their military might, in those cases where they perceive direct threats to their national security interests. Russia's annexation of Crimea in 2014, and China's permanent demonstration and exercise of its military power in the Asia-Pacific region serve as vivid examples. However, their modes operandi in the 'Greater Central Asia' are different: both implement successfully their 'soft powers' by managing inherited bilateral territorial disputes with each other and with the core group of Central Asian states.

The SCO member states possess different levels and parameters of internal and external (in)security. The SCO Declaration of Establishment emphasises that the Organisation "attaches priority to regional security and...takes all necessary efforts to maintain it."

Ethno-Political and Religious Conflicts

Among the first important documents of the SCO is the 'Shanghai Convention on Combatting Terrorism, Separatism and Extremism' adopted in June 2001. Against a background of growing nationalism, the ethno-political and religious conflicts in the multi-ethnic and multi-religious states have tended to become dominant inside the affected

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areas of the given states. Under certain circumstances, they can morph into international conflicts involving several SCO member states. Emphasising that "separatism and extremism, as defined in this Convention, regardless their motives, cannot be justified under any circumstances," the signatory states minimised their involvement in these types of conflicts on each other's territories. They recognise the danger, that these conflicts, in case of the intervention of a third party, may spread. Thus, they prefer to consider them as exclusively internal affairs.

This approach proved to be effective in managing conflicts between the SCO Central Asian members Kazakhstan, Uzbekistan, Kyrgyzstan, and Tajikistan. The possibility of an overt conflict between these states is low. They do not pose security threats to each other, nor do they position themselves as rivals. There were several overt conflicts after 1991 that, however, did not transform into international ones and remained within the internationally recognised borders of the given states. In 2010, the clashes between the Kyrgyz majority and Uzbek minority in the Osh and Jalal-Abad areas of Kyrgyzstan erupted. Uzbekistan preferred not to intervene, and limited its role by providing temporary shelters to Uzbek refugees.

The most recent ethnic clashes in the Jambyl region of Kazakhstan between Kazakhs and the Dungan minority group on 8 February 2020 ended up with 11 deaths and more than 100 wounded. Several thousand residents of the villages, attacked by Kazakhs, fled to neighbouring Kyrgyzstan. This event was interpreted by the Kazakhstan authorities as a domestic dispute rather than as an ethnic conflict.

Ethnic and religious separatism is a very sensitive issue for China and India. Within the SCO area there are two major 'hot spots': the Xinyang Uyghur province in China, which borders Mongolia, Russia, Kazakhstan, Kyrgyzstan, Tajikistan, and Pakistan, and Jammu and Kashmir region in India, which is the subject of a long lasting dispute between India and Pakistan. Within the framework of this analysis, most interesting are the motivations and approaches of the SCO member states to these complicated and multilevel ethnic and religious conflicts.

China's Xinjiang Uyghur province is a crucial knot in the implementation of its 'Belt and Road' Initiative. China needs, first, to prevent any instability in this area well-known for its long lasting ethno-religious conflict between the Muslim–Turkic ma-



Photo: SCO

Using the slogan 'Travel to the Pearl of the Great Silk Road', the SCO organises cultural venues like the 'Days of Uzbekistan Culture in Beijing' on 25 December 2019.

jority and the Chinese minority and, second, to secure the support of those SCO member states, the population of which is dominantly Muslim and Turkic: Kazakhstan, Kyrgyzstan, and Uzbekistan.

A low intensity tension arises between China and Kazakhstan in connection with the situation in Xinjiang. International organisations view China's 'Uyghur policy' as one of the worst human rights abuses in several decades based on ethnic-religious identity issues. China presents its policy in this province as a fight against terrorism, and completely ignores the international community's condemnation and concerns regarding a detention of more than 1.1 million Uyghurs, Kazakhs, Kyrgyz, and representatives of other Muslim minorities. More than 2 million are subjected to 'reeducation' and are forced to undergo indoctrination in 'educational' camps.

However, neither Kazakhstan nor Kyrgyzstan, to say nothing about Uzbekistan, are ready to challenge their strategic partnership with China because of the violation of the human rights of their co-ethnic group by Chinese authorities. China silences its potential critics inside the SCO by providing substantial infrastructure loans to all interested parties. In parallel with a toughening of its policy in Xinjiang, since January 2019, China allows some representatives of Turkic-Muslim minority groups (Kazakh, in particular) to abandon their Chinese citizenship and to leave the country. A combination of mutual economic benefits, together with China's 'goodwill' gestures and the activity of diplomats, permit all parties indirectly involved with the situation in Xinjiang to avoid discussions on human rights violation within the SCO.

The full membership of India and Pakistan in the SCO, at first glance, brought into this international structure the Jammu and Kashmir problem. Three major insecurity components are the Indo-Pakistani territorial dispute, the Indian-Pakistani ethnic conflict and the Hindu-Muslim religious conflict. This ongoing interstate issue is still far from resolution.

The strategic strength and solidity of the SCO was tested in 2019. In February, a terrorist attack by the Pakistani militant group 'Jaish-e-Mohammad' on an Indian paramilitary convoy killed at least 40 soldiers. It was followed by India's air strikes inside Pakistan territory. A new round of dangerous escalation began in August after India unilaterally revoked the special status of Jammu and Kashmir, thereby factually annexing Kashmir, and violating broadly the rights of its Muslim population.

The SCO did not intervene and did not offer any mediation. Russia and China acted in their capacity as permanent members of the UN Security Council. Although they silently supported opposite parties to the conflict (Russia was mainly in line with India's decision and China supported its long-term partner, Pakistan), both powers were encouraging the conflicting parties to find a solution through bilateral compromises and agreements. In turn, neither India nor Pakistan viewed the SCO as a body capable of resolving this ongoing conflict. In particular, at the Davos Economic Forum, on 22 January 2020, Pakistani Prime Minister Imran Khan called upon the US to mediate the Kashmir crisis. In the meantime, recognising the limits of the SCO, the parties to the conflict are not excluding



possible bilateral contacts on the margins of the SCO Summit scheduled in New Delhi later this year.

A Common Security Threat

Terrorism, spreading mainly from Afghanistan and, in most recent years, also from Syria and Iraq, is the only common security threat for the SCO member states. Because of its extreme complexity, the Afghan problem is beyond the framework of this analysis. However, the very idea of establishing the SCO as a regional coalition was rooted in a widespread demand to stabilise Afghanistan and minimise immediate threats, such as terrorism and drug trafficking, from spreading and influencing the broader regional security. From its initial steps, the SCO has been trying to address the challenges posed by the long lasting multilevel and multidimensional conflict in Afghanistan.

A few months before al Qaida's attacks on US soil, on 15 June 2001, the SCO adopted the above-mentioned 'Shanghai Convention on Combating Terrorism, Separatism and Extremism'. It was followed by a series of other documents, such as the Agreement on the Database of the Regional Anti-Terrorist Structure of the SCO (2004), the Concept of Co-operation between SCO Member States in Combating Terrorism, Separatism and Extremism (2005), the Convention on Counter Terrorism of the SCO (2009), and the Convention of the SCO on Combating Extremism (2017).

Among the first steps aimed at minimising the threat to all states bordering Afghanistan were the establishment of the SCO

Regional Anti-Terrorist Structure in June 2002, and the special SCO-Afghanistan Contact Group in 2005 (SACG - its activity was suspended in 2009 and resumed in October 2017). In 2012, Afghanistan was granted observer status in this organisation and, in 2015, the Afghan government applied for full membership. Conversely, SCO member states are trying to avoid full-fledged involvement in the resolution of the intrastate Afghan conflict. Their approach is based on concerns that terrorism, drug trafficking, and extremism will expand across the Afghan borders and spread into the area of Greater Central Asia. Therefore, at least in the medium term, the SCO involvement will be limited by the framework of the SACG.

The SACG meeting in April 2019 in Bishkek was marked by the development of the SCO's Roadmap for Afghanistan. As China's President Xi Jinping confirmed in June 2019: "The SCO firmly supports the Afghan-led and Afghan-owned peace and reconciliation process. We will make full use of the SCO-Afghanistan Contact Group, step up cooperation in various fields and play a constructive role in the early realisation of peace, reconciliation, stability and development in Afghanistan." According to US military sources, the Afghan government controls only 53.8% of districts, "while 12.3% of them [are] under insurgent control or influence, and 33.9% of districts were contested." Therefore, the SCO's hesitation is understandable, and this organisation coordinates its activity with several international organisations – the UN, in particular – to contain a 'familiar' terrorism

threat rooted in the Afghan civil war. In the meantime, its member states are engaged in intensive bilateral relationships with Afghan stakeholders.

However, a new type of terrorist threat demands the immediate full-scale attention of all the states affiliated with the SCO. Instability and insecurity in Afghanistan at large has created a fertile ground for different terrorist Organisations – first of all, al Qaida and later ISIS. In January 2015, the latter announced the establishment of its Khorasan Province with inclusion of Afghanistan, Pakistan, Iran, all states of Central Asia, and some parts of India and Russia.

Currently, losing ground in Iraq and Syria, the ISIS fighters are moving to Afghanistan and to the former Soviet republics of Central Asia. Antonio Giustozzi, one of the leading experts on Islamist insurgency in the region and author of 'The Islamic State in Khorasan: Afghanistan, Pakistan and the New Central Asian Jihad,' estimates that the number of ISIS fighters in Afghanistan is between 5,000 and 14,000, including those of Central Asian origins. Some sources indicate the number of the Central Asians fighters as roughly 7,000. Addressing the SCO Heads of State Council Meeting on 14 June 2019 in President Vladimir Putin stressed that "[the] immediate task now is to ensure the complete elimination of hotbeds of terrorism that remain in Syria, primarily in Idlib, and at the same time to increase the volume of humanitarian aid and assistance to the economic reconstruction of Syria provided by the international community." However, it is quite difficult to fully control and prevent a return of ISIS fighters to the Central Asian states, or to avert their attacks from Afghanistan. The most vulnerable is Tajikistan. It is already under direct assault by ISIS, which took responsibility for the two attacks in 2018 and 2019. In the meantime, some experts have expressed doubt as to ISIS was behind the attack on 6 November 2019.

Concluding Remarks

A growing number of unconventional threats, first and foremost proceeding, in SCO terminology, from 'three evils' – terrorism, separatism, and extremism – have called forth a unity and coordination of efforts and actions from SCO member states. In the meantime, although the (in)security parameters of member states are quite different, none can become involved in a proxy war.

Several factors allow the SCO to maintain a significant level of stability and security

as a result of a constellation of economic, political, and military measures:

A) Economic cooperation is a strong stabilising factor. Two main economic projects, such as the Chinese BRI, the Russian gas pipeline 'Power of Siberia', and others secure a long-term partnership of all SCO member states.

B) By keeping a low-profile involvement in the internal affairs of each other, the SCO is capable of 'locking' the ethnic and religious conflicts within the territory of a given state, therefore a priori excluding its spread into neighbouring states.

C) SCO member states oppose an external military presence in the area of their common strategic interests. Under the pressure from other member states, namely Russia and China, Uzbekistan and Kyrgyzstan required the US government to close its air military bases in Karshi-Khanabad (2005) and Manas (2014), respectively. Both bases were used by the US military in operations against the Taliban after the 9/11 terrorist attacks in New York City and Washington, DC. Russia has its military bases in Kazakhstan, Kyrgyzstan, and Tajikistan. China has a military base in Tajikistan and currently is considering the establishment of another in Kyrgyzstan.

D) The SCO pays serious attention to military cooperation. To improve the joint capacities to, first of all, combat terrorism, the SCO conducts biannually a series of 'Peace Mission' exercises, which include three phases: strategic consulting, preparation for a "battle," and the implementation of live-fire combat. However, observers have noted that the level of participation of the Central Asian states in the most recent 'Peace Mission - 2018' (2018) remained quite low and did not increase compared to the 2017 drill. Uzbekistan participated in it as an observer. One month later, in September 2018, Russia and China also conducted a joint full-scale military exercise 'Vostok-18'.

It should be noted that security for Kazakhstan, Kyrgyzstan, and Tajikistan is provided mainly by their bilateral military agreements with Russia and their participation in the Russia-led Common Security Treaty Organisation.

E) The SCO considers an extended US military presence and US diplomatic efforts in Afghanistan as a positive contribution to facilitation of the inter-Afghan reconciliation process. The US-Taliban "Agreement for Bringing Peace to Afghanistan," which was signed on 29 February 2020, in presence of leaders from Pakistan, Qatar, Turkey, India, Indonesia, Uzbekistan, and Tajikistan, has been cautiously welcomed by the SCO.



In parallel with success stories, the SCO is facing several crucial challenges, some of them must be acknowledged.

- A growing and broadening Chinese economic presence in 'Greater Central Asia' will inevitably be followed by an expansion of its military presence. In the former Soviet republics, the Chinese military component (which includes also the growing arms sales) will complement and strengthen China's 'soft power'. Russia, being excluded from the BRI, uses its energy and arms supplies as a strong counterweight to balance Chinese activity in SCO member states. Sooner or later, however, Russia will view China's strategic partnership with the former Soviet republics of Central Asia as a direct threat to its strategic interests in this part of the SCO's geostrategic area.
- There still remain several open questions regarding the common security threats. Answers to them fully depends on the results of, on the one hand, an inter-Afghan dialogue and, on the other hand, the Taliban-ISIS ongoing fight. A high probability exists that those Taliban fighters who disagree with the US-Taliban agreement will join the ranks of ISIS-Khorasan, therefore posing a very serious security threat to SCO member states.

Besides, the expelling of ISIS Chechen and Central Asian fighters from Syria and Iraq, and their penetration into the SCO area together with continuing activity of ISIS-Khorasan in Afghanistan, can provoke a revitalisation of local Islamist Organisations (Islamic Movement of Tajikistan, Islamic Movement of Uzbekistan, and others). It can also promote the further radicalisation of the most vulnerable strata of the population in SCO states, thereby threatening each state and the system of regional security in general. Conversely, it

cannot be excluded that leaders of the Central Asian states may exaggerate, to some degree, the threat from ISIS in order to receive more security guarantees and more resources.

- All SCO member states possess poor human rights records. To a different extent these states are authoritarian or tend toward authoritarianism. According to a Freedom House Index, the only democratic state among them is India. The fight against terrorism, separatism, and extremism will undoubtedly affect the human rights situation in the SCO, through toughening of state control over any type of opposition. China, in particular, provides through its 'Digital Silk Road Project' surveillance systems to Kazakhstan, Kyrgyzstan, and Uzbekistan.

Conclusion

In sum, in dealing with ethno-political and religious conflicts as well as any bilateral tensions, a preferable and mutually acceptable approach within the SCO in long-term perspective will involve conflict management rather than conflict resolution. Meanwhile, the growing danger of terrorism demands from all member states strong involvement and coordination of efforts. Therefore, first, they will inevitably increase their cooperation within the SCO's Regional Anti-Terrorist Structure. Their further participation in 'Peace Mission' drills will also contribute to a strengthening of SCO's military capacities. Second, one can hope that the SCO's Roadmap for Afghanistan and the US-Taliban Agreement contain some common approaches to the resolution of the Afghan problem, which will allow all the parties concerned to coordinate their efforts further.

The Brussels Backdrop



A Stronger Europe in the World

Joris Verbeurgt

In the last Brussels Backdrop, we gave a short overview of the members of the new European Commission (EC) and their competences. In this Brussels Backdrop, we will focus on the newly created Directorate General for Defence Industry and Space and on the political guideline “A Stronger Europe in the World” drawn up by Ursula von der Leyen.

Europe's Defence and Security Policy

Before her election as president of the EC, von der Leyen presented a 24-page election programme titled “A Union that strives for more. My Agenda for Europe. Political Guidelines for the next European Commission 2019–2024”. In chapter 5, “A Stronger Europe in the World”, she explains what she wants to achieve as commission president with regard to Europe's role in the world and the defence of the continent and its interests.

Soft Power

First of all, she wants to strengthen what she considers to be ‘Europe's responsible leadership’. Von der Leyen mainly relies on Europe's ‘soft power’ to enhance the EU's legitimacy on the international scene. The tools to achieve that goal are a strong, open and fair trade agenda. Negotiations and trading partnerships are seen as the cornerstone of Europe's reach and attractiveness. All new agreements need to have the highest standards of climate, environmental and labour protection. Trade will be used to export the European values of responsible global leadership across the world. The EU will always look for multi-lateral solutions and lead the efforts on

updating and reforming the World Trade Organization.

Africa, the Western Balkans and Brexit

Second, von der Leyen wants Europe to play a more active role by working hand in hand with the neighbours and the partners of the EU. The European values and respect for international law are core to that policy. Africa is considered Europe's closest neighbour and ‘natural partner’ for which a comprehensive strategy based on equality, freedom and dignity needs to be developed. The EU is the world's biggest donor of development assistance in the world and especially in Africa, which has the youngest, fastest-growing middle class in the world.

With regard to the Western Balkans, von der Leyen reaffirms the European perspective on this issue and seeks to continue the reform process across the region. Therefore, she fully supports the idea of opening negotiations with North Macedonia and Albania. Again, promoting and sharing the EU's core values and interests are fundamental to the project. An ambitious and strategic partnership with the United Kingdom after the Brexit, is a third priority for the von der Leyen commission.

A Common Foreign and Security Policy and NATO

In order to strengthen and unify Europe's voice in the world, the new Commission will push for qualified majority voting to become the rule in this area. All external action, from development aid to the EU's Common Foreign and Security Policy, must be coordinated with the EC president.

Above that, the EU needs to spend 30% more on external action programs, increasing the total to €120Bn.

Von der Leyen's soft power approach becomes even more obvious when she discusses the defence of Europe. According to von der Leyen, Europe has always gained its power through peace, and its peace through power; therefore, in her view, peace, security and development are all mutually dependent. However, she wants NATO to remain the cornerstone of Europe's collective defence system. Although the EU will stay transatlantic, von der Leyen will take bold steps towards a genuine European Defence Union. Therefore, the European Defence Fund to support research and capability development will be strengthened. At the global level, the EU will continue to play an active role at the United Nations and conclude closer partnerships with Africa to implement solutions to challenges such as instability, cross-border terrorism and organized crime.

Strengthening Europe's Defence and Space Industry

Under the presidency of von der Leyen, a new Directorate-General for Defence Industry and Space (DG DIS) is planned. It will have tasks transferred from the existing Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs. The responsibilities include financial management of space programs, space policy, Copernicus and defence, EU satellite navigation programs and the part of ‘access to procurement markets’ dealing with defence procurement. It is no surprise that a Frenchman, Thierry Breton, will lead this department once it is established. Now that the United Kingdom has left the EU, France

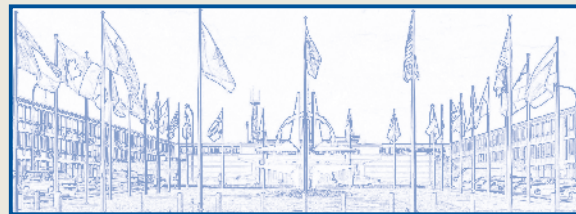


Photo: European Union External Action

The new EC President von der Leyen wants the EU to “stay transatlantic and become more European”.

has the most important defence and space industry in the EU and president Macron expects a lot of benefits for France and for the EU by lifting it up to a European level.

The French Connection

Paris wants the EU to gain the status of a strong independent player in international politics. In order to do so, it wants to maximise its influence over the EU security and defence policy and wishes for the EU to develop political, industrial and military strategic autonomy. In co-operation with Washington if possible, but in opposition to the US if needed. This aspect of the French ambitions frightens strong pro-Atlantic countries like the Netherlands and Poland, who fear that an alternative for NATO might be in the making. And although France has been lobbying for many years for a closer integration of the defence industry within

the EU, it remains also sceptical of giving more competence in security and defence to the EC. France prefers intergovernmental co-operation in this area. It remains to see how these hesitations will impact the effectiveness of the DG DIS.

Tasks

The new DG will be responsible for the implementation of the newly created European Defence Fund, an instrument which will offer financial support for the cooperative research and industrial projects. The DG will also ensure an open and competitive European defence equipment market and enforce EU procurement rules on defence. Third, it will be in charge for implementing the Action Plan on Military Mobility (in collaboration with the DG Mobility and Transport). Other tasks consist of fostering an innovative space industry in the EU,

implementing the future Space Program, covering the European Global Navigation Satellite System (Galileo), the European Geostationary Navigation Overlay Service (EGNOS) and the European Earth Observation Programme (Copernicus). It is likely that, once the 2021-2027 multiannual financial framework is adopted, additional units to manage the fund will be established.

The establishment of a directorate-general for defence had been discussed in Brussels for over a year. The decision indicates that the defence policy is becoming an increasingly important field of activity of the EC. Since 2019 the EU has been intensively developing instruments aimed at increasing co-operation between the EU member states in the area of the defence industry, military capabilities, EU civilian crisis management, military mobility, and EU activity in its neighbourhood. Recent examples are the Permanent Structured Cooperation (PESCO), the Military Planning and Conduct Capability (MPCC), the Coordinated Annual Review on Defence (CARD) and the Capability Development Plan (CDP).

Conclusion

Von der Leyen announced that “we need further bold steps towards a genuine European Defence Union” and that the EU needs to “stay transatlantic and become more European”. The EU initiatives in industrial, military and civilian matters and in security and defence which have been implemented to date, have been rather limited in scope and their objective is not to create a European army. Therefore, in addition to the EU’s proposed soft-power projection in the world, NATO will remain the basis of Europe’s collective defence in the future.

Turkey and Ukraine – A Strategic Partnership on the Black Sea

Korhan Özkilinc

Political relations between the two countries began in December 1991, when Turkey was one of the first countries to recognise Ukraine, which had just gained independence. Since February 1992, uninterrupted diplomatic relations have existed until today. While Turkey's relations with Russia have priority, that does not mean that Ukraine will not play an important role for Turkey in the future. The two countries

will maintain the "High-Level Strategic Cooperation Council", which was established in 2011, in order to achieve important goals together, both politically and economically. Furthermore, he appealed to Moscow to stop the fighting in the Donbass region. The two presidents have set themselves ambitious goals. In 2018, the volume of joint economic trade was about US\$4Bn and, with good planning and mutual investment,

ending the ongoing war in Ukraine's eastern provinces and resolving the Crimean problem while rebuilding Ukraine's ailing economy is a difficult task, as one of the most important countries bordering the Black Sea, Turkey will play its part in the strategic alliance with Ukraine. In November 2018, the "High-Level Strategic Cooperation Council", which has been in existence since 2011, resumed in order to press ahead with the creation of a free trade agreement with Turkey.

Geopolitical Stability

Since Ukraine's independence in 1991, bilateral relations with Turkey have improved steadily. The Black Sea region in particular, which plays a key role between Central Asia, Europe and the Middle East, is important for geopolitics. It is, therefore, for both countries to cooperate in the future on economic, security and defence issues. That is why an agreement was signed in 2014 to jointly develop and produce military and technological targets, such as missile systems, UAVs, armoured vehicles, radar technology, and so forth.

When Russia annexed the southern Ukrainian peninsula of Crimea in March 2014, following a referendum, the international community was outraged and declared the referendum to be contrary to international law. At the same time, Turkey began to arrange affairs in the Black Sea behind 'closed doors' with the aim to not only to pacify the conflicts between Ukraine and Russia, but also to improve relations with neighbouring countries, which was particularly evident in Turkey's bilateral measures in the Caucasus. Turkey's intentions are far-reaching. As a strategic partner, Turkey is trying to support Ukraine's reform strategy and, at the same time, to build up Ukraine in its hemisphere in the eastern Mediterranean and in Syria as a counterweight to Russia, thus correcting Russia's influence where necessary. In addition, Turkey is deeply committed to the security of the Crimean Tatars and of Ukrainians of Turkish origin because of ethnic kinship. The territorial integrity and security of Ukraine is, therefore, in the interests not only of the Ukrainian people, but also of the Turkish ethnic minorities in Russia

Photo: Black Sea Shield



The Turkish-Ukrainian AKINCI MALE UAV

tried to create a free trade area in 2010, but this was suspended in 2013. When Russia annexed the Crimea, Prime Minister Erdogan did not recognise the Russian annexation and promised to continue supporting Ukraine's territorial integrity. Both countries have two important interfaces: the Black Sea Naval Cooperation Task Group and the Black Sea Economic Cooperation Members, and other initiatives will follow.

Economic Relations

Turkish President Recep Tayyip Erdogan has repeatedly stressed, both in meetings with former Ukrainian President Petro Poroshenko and current President Vladimir Zelensky, that Turkey will not accept the annexation of Crimea by Russia and that it stands behind the territorial integrity of the country. During the recent visit of President Zelensky to Turkey, President Erdogan, reiterated his criticism of Russia, stating that the two countries

would reach US\$10Bn in the near future. In 2018, Turkey imported goods worth a total of US\$2.7Bn from Ukraine and exported US\$1.5Bn in return. More than 600 Turkish companies are said to operate in Ukraine, mainly construction companies. Of course, it is premature to say anything about the future development of both countries, because President Zelensky has little experience in politics. His election campaign promised radical changes, which makes it difficult to speculate about the future of the country. However, it is to be expected that he will meet the expectations of his people in the medium-term, which is not going to be easy when faced with such a shrewd opponent as Russian President Putin. This is why President Zelensky did the right thing when he visited Turkish President Erdogan in Ankara on 7 and 8 August 2019, after his election, to maintain good relations on the Black Sea and to support Ukraine in resolving its conflict with Russia. Although

and Ukraine. It must be stressed that religion plays a major role in relations between Russia, Turkey and Ukraine, by which we mean the Ecumenical Patriarchate of Istanbul. In Istanbul, the seat of the spiritual head of some 300 million Orthodox Christians worldwide, the Ukrainian Autocephalous Orthodox Church was founded – the independent Ukrainian Church, which for 300 years had been detached from the control of Moscow. After gaining political independence from the Soviet Union, Ukraine has recently once more regained religious independence.

The Defence Industry

After the collapse of the Soviet Union, Ukraine had a large amount of obsolete Soviet defence equipment, and the cost of maintenance was immense. Moreover, Ukraine made structural mistakes by failing to reform the arms industry early on. Moreover, the strategic enterprises that would be important for the future Ukrainian armed forces were established very late. This development brought immense benefits to the Turkish defence industry, which was on the verge of dying off, in terms of acquiring new capabilities and, at the same time, provided the gateway to western weapons standards for the Ukrainian defence industry. This created the preconditions for the modernisation and rapid integration of the military complex into the Western value chain, while at the same time making it competitive on world markets.

Following the Russian invasion of Crimea in 2014, Ukraine began to modernise first its armed forces and then its own arms industry to western or NATO standards. In this regard, NATO partner Turkey had a special position as it had been very supportive to Azerbaijan in its modernisation and integration into NATO standards.

In 2014, Ukraine and Turkey agreed on several collaborations on promising projects such as missile systems, engines, combat aircraft and UAVs. Obviously, it will be a 'win-win' situation for both sides. Turkey is trying to expand its competence in the defence industry, and Ukraine in return is trying to bring its modernisation projects up to western standards. Naturally, the projects are still small at present, but it looks as if cooperation will be further intensified. While the main focus is on UKROBORON-PROM and ASELSAN, both sides are also integrating their own SMEs into the project. In March 2017, both governments signed a far-reaching agreement on technological and economic cooperation. The main objective is to develop and produce key technologies in both countries, and it looks as if joint ventures will also shortly follow. A strategic



Photo: Kremlin

Since 2017, Iran, Turkey and Russia have been negotiating within the framework of the so-called 'Astana process' for facilitating the Syrian peace settlement. Depicted is the September 2019 meeting of Presidents Rohani, Erdogan and Putin.

partnership with NATO partner Turkey is essential for Ukraine.

When relations between Russia and Turkey were at a low point, following the shooting down of a Russian Su-24 bomber by a Turkish F-16 interceptor on the border between Turkey and Syria, Ukraine immediately seized its chance and launched a new cooperation initiative in November 2015.

The first cooperation efforts in the defence industry took place in 2016 and 2017. The Turkish company HAVELSAN began cooperation in 2016 and 2017 to jointly develop radar systems and cyber technologies. In 2017, the Turkish Aerospace Industry started cooperation in the field of UAVs. It later became clear that BAYKAR MAKINA was ahead of the game and was achieving far-reaching results. In 2016, ASELSAN contributed to making Ukrainian communication systems compatible with NATO standards. In return, Ukrainian companies were involved in the modernisation of the Turkish Mil M-17 helicopters.

Both countries are pursuing ambitious goals in the defence industry, particularly in the aerospace sector. There is also talk of both sides wanting to produce aircraft together in the Antonov factories. Together with Roketsan, Spets Techno Export is developing reactive armour and ASELSAN is working to engineer the Ukrainian ZASLON active protection system for Turkish battle tanks.

In early 2019, former President Poroshenko announced that Ukraine had purchased six Bayraktar TB2 UAVs from Turkey, as well as two truck ground control stations and three ground control stations, for about US\$70M. The deal was closed during President Erdogan's visit to Ukraine in 2017. When President Zelensky visited Turkey on 7 and 8 August, he visited BAYKAR MAKINA, the manufacturer of the Bayraktar TB2, where he had a close look at the new MALE UAV AKINCI, the engines of which are manufactured in Ukraine. During his visit, an agreement was signed on the establishment of a joint defence company. BAYKAR MAKINA and the Ukrainian company Ivchenko Progress founded the joint venture BLACK SEA SHIELD, whose first project is the development and production of the AI-450T turboprop engine from 450 hp to 750 hp. However, even more importantly, is the co-

operation in the space sector as the recently founded Turkish space agency will cooperate intensively with the Ukrainian space agency.

Conclusion

Turkey will continue to bring the Ukrainian armed forces into line with NATO standards, thus further accelerating modernisation. Bilateral relations between both countries will be further strengthened through their joint participation in NATO events even though Ukraine will not become a member of NATO in the foreseeable future. Of course, Turkey benefits from political developments between Russia and Ukraine, but Black Sea politics will continue to be shaped and balanced by the security interests of the Ukraine, Turkey, and Russia. This network of relations is important for Turkey because Turkey is trying to balance Russia's influence in Syria with that of the Black Sea.

The political developments will have a huge impact on the Caspian region and the tense geopolitical region of the Black Sea. The developments are also being watched with suspicion by the US, because a geopolitical weakening in the Black Sea, the Caspian Sea and the Eastern Mediterranean may call its 'world power' status into question. This is also one of the reasons why the US is cooperating with the Kurdish terrorist militias PYD and PKK in Northern Syria and Northern Iraq.

On 16 September 2019, the tripartite summit between Turkish President Erdogan, Russian President Putin and Iran President Hassan Ruhani took place in Ankara. The three states have been negotiating since 2017 within the framework of the 'Astana Process' in order to find a peaceful solution for Syria and to finally enable the refugees to return to the demilitarised buffer zone, which is difficult. President Erdogan stated that the US should not play for time in establishing a PYD free zone in northern Syria, and that if no results were seen in the next two weeks, then Turkey would arbitrarily establish a buffer zone in northern Syria. In this way, the trouble spots in Crimea, the Caucasus and Middle East are connected. What we hope and wish for is a peaceful world. ■



French Security Policy Explained

Giulia Tilenni

As in most countries, French security policy rests on basic strategic documents. Nevertheless, the French Strategic Review approved in 2017 demonstrates well the extent to which the French approach to the protection of the country's strategic interests is based on some peculiar provisions.

Generally speaking, a national security strategy outlines the government's visions of the country's strategic interests and draws the array of means put in place for defending it. Such a strategy usually identifies the most relevant geopolitical scenarios for the country, the main national and citizen interests to be protected at home and abroad, the

The French Strategic Review

Approved in 2017, the French Strategic Review defines the defence and security strategy of the country, identifying the threats that France is confronted with and outlining possible responses, as well as the country's ambitions at the international level.



Photo: Kremlin

France's international role, which it has achieved due to its nuclear capabilities, also leads to greater responsibility and makes the country a target as well.

domestic/international threats and possible responses to them. Consequently, the defence policy is usually enshrined in the country's security strategy. As will be further analysed, France's approach to security strategy is rather unique.

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In an attempt to adapt the country's posture in the face of emerging threats and security needs, four White Books have served as a framework for the country's strategy. The first, published in 1972, is considered as the founding document of French defence strategy and the national doctrine on the nuclear deterrent (dissuasion). Since the end of the Cold War, major updates of the existing strategy have been needed to deal with the new paradigms. This ended in

the publication of a new White Book in 1994, which also served as a driver for the professionalisation of the French army. The rise of new international actors and the emergence of new threats led to two new editions, in 2008 and 2013. Both documents stated that the constant evolution of the international environment and the need to modernise the French armed forces accordingly necessitated more frequent updates of the country's strategy. The preface to the 2013 edition explains that although the White Books are predicated on mid-term engagements (15 years), the rapid evolutions of contemporary geopolitics require a revision every five years.

France's International Role

In the French case, internal and international defence and security policies are intertwined. Indeed, the country's prominent international role make it more exposed to externally-driven challenges and dynamics. The increasing assertiveness of state and non-state actors all over the world, and the consequent proliferation of security threats, have multiplied the operational theatres in which French armed forces operate simultaneously, with an impact on capabilities and human resources. As of December 2019, 5,000 French soldiers were engaged in the two main external operations, Barkhane in the Sahel and Chammal in Syria and Iraq. A further 1500 troops participate in UN, EU or NATO operations in Africa, the Middle East, Northern Europe and the Mediterranean Sea.

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In line with these considerations, the Strategic Review 2017 and the Military Programming Law 2019-2025, promotes the consolidation of French international ambitions through the strengthening of its capabilities, including nuclear deterrence as well. Indeed, France's posture must take into account the country's "objective strategic singularity", as Min-

in the following decade thanks to the development of the first French nuclear vector, Dassault MIRAGE IV (1964) followed by ground-launched Aérospatiale S2 Intermediate-Range Ballistic Missiles (IRBM) and submarine-launched M-1 Sea-Launched Ballistic Missiles (SLBM). Defined as "Weak-to-strong deterrence", the French nuclear doctrine merges nu-



Photo: VOA

French soldiers deployed on Operation Barkhane talking to local citizens.

ister Parly defines it in her preface to the French Security Strategy: France is now the only EU member state to have a nuclear deterrent and a permanent seat at the UN Security Council.

To protect its citizen's interests, to better respond to threats (such as the proliferation of military powers deploying or wishing to deploy considerable naval capabilities and/or nuclear assets), and to maintain its strategic independence, France wants to consolidate its strategic functions and to modernise its armed forces and their equipment. The functions to focus on are nuclear deterrence, the protection of the nation from military threats, the capability to anticipate threats in order to act or react accordingly, the intervention aimed at protecting citizens and vital interests, and the stabilisation of foreign countries relevant for France.

A Nuclear Deterrent

The idea of providing France with nuclear military capabilities dates back to 1954, under the government of Pierre Mendès-France, and became a reality

clear capabilities and the international role of France, thus being a founding element of the country's 'bargaining chips' in foreign policy.

In 2015, in a speech given at Istres Air Base, the then President Hollande said, "nuclear deterrence aims to protect our country from any state-sponsored aggression against its vital interests, wherever it comes from, and in whatever form".

Due to their devastating effects, nuclear weapons are always intended as a defence tool rather than as a mean to obtain a military advantage over the enemy. Thus, deterrence is defined as "what allows us to preserve our freedom of action and decision in all circumstances, because it is deterrence that allows me to avoid any threat of state blackmail that would aim to paralyse us", President Hollande added in his speech.

The use of the pronoun 'me', far from being a hazard, allows for explaining another peculiarity of the French defence doctrine – the short command chain due to the concentration of power in the hands of the President. According to French law, the President has greater powers compared to European counterparts. He is

the head of the Armed forces, the person in charge of foreign policy decisions and has the final decision on the launch of nuclear weapons. The coordination of the French defence and security policy is entrusted to the National Security and Defence Council, a special council chaired by the President and including the Prime Minister and the Ministers of Interior Affairs, Foreign Affairs, Defence, Economy and Budget. A reform approved in 2009 introduced two special ad hoc configurations depending on the matter. The Nuclear Weapons Council includes the President, Prime Minister, Minister of Defence, Chief of Staff of the Armed Forces, General Delegate for Armaments and Director of Military Applications of the Atomic Energy Commission. Nevertheless, the President makes the final decision on whether using nuclear weapons. Indeed, he is in charge for assessing the country's vital interests, mainly related to the territorial integrity and the protection of the population, the threats to them and the eventual response to give back. Given that possessing a nuclear arsenal means being able to "preserve the capability to stay alive", France can, as a last resort, launch a nuclear warning aimed at restoring deterrence if vital interests are put at stake.

The Principle of Strict Sufficiency

The French doctrine is based on the principle of strict sufficiency: the nuclear arsenal must have the lowest size allowing for maintaining a credible deterrent and protecting national security. The idea is to have a nuclear force capable of "inflicting absolutely unacceptable damage to the enemy's centres of power, that is to say, on its political, economic and military nerve centres", the country's strategy explains. Thus, France has gradually reduced its nuclear arsenal in the last decades to readjust it to existing threats. Moreover, Paris halted any new nuclear test to join the Comprehensive Test Ban Treaty in 1996, ceased the production of fissile materials for nuclear weapons and closed some of the sites dedicated to nuclear activities.

Since 1997, French nuclear deterrence, which is ensured permanently, has been ocean- and air-based only, when the last French mobile land-based Aérospatiale S-3 IRBM was dismissed. The two components are considered as indivisible and complementary, and their performances, flexibility and features allow for responding to the principle of strict sufficiency.



Today, French nuclear deterrence is built around Ariane Group's M-51 SLBMs carried by four Naval Group LE TRIOMPHANT class Sub-Surface Ballistic Nuclear submarines (SSBN) and MBDA's ASMPA supersonic nuclear missiles carried by ground-based Dassault RAFALE-B and sea-based Dassault RAFALE-M. Due to their peculiar role in guaranteeing the freedom of action of the French armed forces, the two are supported by a set of conventional capabilities, to provide a wider range of strategic options and better respond to the operational needs. Moreover, a quota of means contributing to deterrents can be employed for conventional operations too.

Being a core part of the French defence strategy, the ocean-based and the air-based deterrent need to be constantly modernised to ensure their safety and their efficiency, thus requiring consistent investments for maintenance and Research and Development. The Military Planning Law 2019-2025 reaffirms President Macron's willingness to renew French nuclear capabilities to maintain a credible deterrent beyond 2030. The ocean component will benefit from the delivery of four BARRACUDA class nuclear attack submarines by 2025 and the commissioning of Ariane Group's M-51.3 SLBMs. The future sustainability of the oceanic component will be ensured by launching the design works of the 3rd generation SSBN (set to replace the TRIOMPHANT class in about 15 years) and the development of future M51 versions according to an incremental approach. The modernisation of the airborne component will continue as well, in particular with the shift to the unique carrier (Dassault RAFALE) and the mid-life upgrade of MBDA ASMPA air-to-ground missile. Conventional capabilities that are essential for the full operability of the two components will be modernised accordingly. Thus, nuclear attack submarines, ATLANTIQUE 2 maritime patrol aircrafts and frigates are under renovation, as well as RAFALE fighters and MRTT tankers.

The "Internationalisation" of the French Strategy

Despite structured as a "classic" security strategy, the 2017 Strategy emphasises some country-specific trends. Indeed, the classic division between security and defence and national/external threats does no longer exist in the French strategy. On the one hand, the emergence of hybrid threats and militarised terrorism requires to rethink the existing dif-

ference between defence and security policies. On the other, the international role of France does not allow for a rigid identification of domestic and external threats. As will be explained, the fact that French soldiers operate in relevant operational theatres, namely the Sahel region, requires important efforts to ensure sustainability and to transform French troops and French soil as perfect targets for retaliation. Moreover, the emergence of new operational environments (cyber space, exo-atmospheric space) and the possibility to use a panoply of IT-related tools for malicious uses have in fact put an end to the classic diversification between war, peace and crisis times.

The Continuum Between Defence and Security

The terrorist attacks that hit France in 2015 were a tipping point for the country's defence and security strategy. For France, terrorism was not a new phenomenon but the development of 'militarised Jihadist terrorism' willing to strike Western societies has radically changed the

Opération Sentinelle, involving 10,000 soldiers (of which were 3,000 reservists), explains well this new approach. Launched in the aftermath of the terrorist attacks of January 2015, Sentinelle is the first application of a provision included in the 2013 White Book, stating that, in case of a major crisis, up to 10,000 soldiers from land forces can be pledged to support civil security forces, together with appropriate naval and air force resources. Sentinelle is aimed at better supporting police forces in the protection of the zones that can be targeted by terrorist attacks (e.g. tourist sites, airports, train stations, etc.). The 2017 strategic document explains that the use of soldiers for missions belonging to the traditional homeland security sphere is "in line with the role of the armed forces as an ultima ratio, through permanent adaptation to the evolution of the threat and reinforced complementarity with other public security actors". In the following years, Sentinelle's functioning has been revised several times to better serve security needs. The reform approved in September 2017 has significantly modified the operational doctrine of Sentinelle to increase flexibility and reactivity while

Photo: VOA



A burning VBCI during Operation Barkhane in Gao, Mali, after a terrorist attack

French defence paradigm. Indeed, standard methods can prove ineffective when it comes to master hybrid and 'militarised' security threats, which may require the need to use military means. All of this considered, the French Strategic Review argues that militarised terrorism justifies the existence of a security-defence continuum.

reducing predictability. For instance, the revision of March 2019 was aimed at easing internal security forces' mobilisation for law enforcement operations during the 'Yellow Vest' rallies. Although the purpose of Sentinelle has been rarely been questioned, criticism has been voiced in recent years, as this operation affects the forces' readiness due to its impact on



human and material resources. Indeed, several hundreds of soldiers have been patrolling the streets of France for five years now, using the materials in the inventories of their military units. Moreover, the magnitude of its scope and the assumption that a continuum between security and defence exists, have raised the question of the balance between the strategic functions of intervention and protection – the one Sentinelle belongs to. A concrete sign of changing approach is the procurement of 3,700 Arquus VLTP-NP vehicles, 730 of which have been delivered. These will replace the ageing Peugeot P4 light vehicles and will also represent one of the primary assets specially dedicated by the army to internal security duties – today a mix of off-the-shelf Land Rover DEFENDER, miscellaneous cars, and legacy troop carriers is used.

The Role of New Technologies

The 2017 Strategy stresses that the development of new operational environments and the strengthening of hybrid threats have an impact not only on Armed forces' capabilities, but also on military planning. On the one hand, the rapid pace of technological progress in the militarily most powerful countries requires substantial Research and Development efforts to keep the armed forces at the cutting edge of technology, but also to develop them into offensive tools against potential enemies. On the other hand, the rise of new environments, such as the cyberspace and the exo-atmospheric space, allows for developing 'comprehensive intimidation strategies' to use against their enemies. The fact that an increasing number of global or regional powers are able to operate in these environments serves as pushing factor in international tensions, and requires the development of special countermeasures. However, these domains need to be monitored on a permanent basis, as threats can emerge at any time and can come from both state and non-state actors. Moreover, the rise of new technologies make operational environments harsher and obfuscates comprehensive situational awareness. Two main consequences stem from emergent technologies and domains of intervention. First, the need of a permanent monitoring puts the classic division between peace, war and crisis times at stake, thus increasing the risk of uncontrolled military escalations. Second, the need to gain a competitive advantage on the enemy in conventional capacities

kicked off a new race for the development of cutting-edge technologies, such as hypersonic speed and stealth.

Conclusion

French strategic planning documents, and, in particular, the one published in 2017, illustrate well to what extent the country's security strategy is driven by endogenous trends. France continues to consider nuclear deterrence as crucial for its freedom of action in foreign politics. President Macron is fully committed to the modernisation and the perpetuation of nuclear capabilities, which were affected by budget cuts in the aftermath of the Cold War. Indeed, maintaining the smallest possible nuclear arsenal under the principle of strict sufficiency requires a constant adaptation to the

sons. First, they are necessary for maintaining the full operational capability of the country's deterrent. Second, they are an indispensable foreign policy tool, as they allow the country to maintain the desired level of strategic autonomy, which includes the capability to redeploy armed forces in the areas of strategic interest. External operations in the Sahel area are the most notable example. In a period when most allies identify the Eastern European border or the Middle East as the areas of vital interest, France continues to focus on Africa and is fully engaged in tackling terrorist groups in this area. The country's conventional capabilities have allowed for launching external operations in the area in 2013 and to sustain them for years with limited allied support in terms of means and

Photo: Claude Truong-Ngoc



French soldiers patrolling Strasbourg as part of "Operation Sentinelle"

operational environment. As highlighted in the 2017 Strategic Review, nuclear proliferation in countries such as North Korea and, potentially, Iran and the renewed military assertiveness of state and non-state actors makes maintaining a credible deterrent a key priority. Cutting-edge technology is of crucial importance for this objective, as increased precision and lethality enhances the credibility of a limited arsenal. However, France's international role, which it has achieved thanks to its nuclear capabilities, also leads to greater responsibility and makes the country a target as well. Thus, conventional capabilities cannot be neglected for two rea-

human resources deployed in theatre. The downside is that terrorist groups consider France an enemy, and the terrorist threat against French soldiers operating in Africa and the French soil remains high, with important implications on the country's security strategy. The most relevant and peculiar ones being the continuum between defence and security, the lack of a rigid division between internal and external threats, and the end of a division between peace, war and crisis times. All things considered, finding the best balance when it comes to investments is far from an easy task. ■



The French Army

Procurement Trends and Future Prospects

David Saw

Unnoticed by many and often uncredited, the French Army is in the midst of a major effort to enhance its operational capabilities through the acquisition of new equipment. In parallel with this it is working to upgrade the capabilities of its existing equipment, as well as investing in spare parts and maintenance to increase the operational availability of legacy systems.

For the senior leadership of the French Army much has changed during their time in the military. In 1990, the French Army was a Cold War army, with its primary mission being the protection of the French territory and Western Europe and its most likely threat being a Soviet or Warsaw Pact aggression into the then West Germany. With the collapse of the Soviet Union, the end of the Warsaw Pact and German reunification that threat was removed from the board. Inevitably the French Army would have to change.

As with practically everywhere else in Europe, the end of the Cold War provided the opportunity to obtain what became known as the 'peace dividend'. This would be the result of cuts in military expenditure, allowing the politicians to spend the money elsewhere. Arguably the most significant change for the French Army in the post-Cold War era was the transition from being a mass conscript army to a much smaller professional force. After the end of the Cold War, it was a common assumption that there would be strategic stasis as there were no more existential threats left to major European states. Of course, that would prove to be no more than wishful thinking. Instead of stasis what would arise was a period of immense strategic instability. New threats would emerge from unexpected directions and this strategic instability continues to this day.

The Framework

The French 'Loi de Programmation Militaire 2019-2025' (LPM), the 'Military Planning Law,' which provides the basis for the organisation, operation, sustainment and future procurement programmes of the French Armed Forces, describes the strategic situation as follows: "The world has entered a period of great turmoil as shown by the findings of the Strategic Review delivered to the President of the French Republic in October 2017. Both France and Europe are faced with grave, diverse and lasting threats. In particular, the persistence of the terrorist threat, the return of power politics and



Photo: Nexter

The French Army CAESAR 155/52 mm truck-mounted artillery system was first used on operations in Afghanistan in 2009. There are currently 77 systems in French service.

the weakening of the international order are leading to a durably unstable and uncertain strategic environment. In this strategic environment, also marked by the emergence of new forms and spaces of confrontation, our armed forces will now have to deal with more challenging conflicts and increasingly well-equipped adversaries."

Responding to these circumstances, the French government has instituted a programme known as 'Ambition 2030.' This calls for "a balanced and full-spectrum force model capable, and sustainably over time, of guaranteeing the fundamental operational capabilities that are essential for our defence (deterrence, protection, knowledge and anticipation, prevention and intervention). Relying on modernisation of the armed forces and enhanced cooperation, this force model must enable us to guarantee our national strategic autonomy, now integral to the development of a European strategic autonomy. To realise this ambition, the President of the French Republic, Commander-in-Chief of the Armed Forces, assigns to them missions to be accomplished and the related operational contracts, which drive the definition of our forces model for 2030."

There was far more to the LPM than a strategic background brief. There were concrete steps that were to be taken that would help to make these future ambitions more of a reality. First and foremost was the recognition that France must increase its defence expenditure. The eventual objective is that French defence expenditure will reach two percent of Gross Domestic Product (GDP) by 2025. Essentially, this is the agreed NATO standard for military expenditure as a percentage of GDP.

As regards defence expenditure, according to NATO figures in 2017 French defence expenditure was 1.78% of GDP. In 2018, it was up to 1.82% and their estimated total for 2019 was 1.84%, with France having a target of 1.9% to be reached by 2023. In 2021, the intention was to analyse the macroeconomic climate to see what measures would be required to meet defence expenditure requirements in 2024 and 2025. Obviously, with the current Coronavirus-inspired political and economic turmoil, there can be no certainties as regards the money being available for even a minimal rise in defence expenditure. Returning to the LPM one of the key aspects was described as "human factors". Here the



Photo: Cynelle Bouju

The EBRC JAGUAR will replace the AMX-10RC, the ERC 90 and the VAB HOT in French Army service. The turret has a 40mm CT cannon, two MBDA MMP anti-tank missiles and an ARQUUS HORNET RWS with a 7.62mm machine gun. By 2025, there will be 150 JAGUAR in service out of 300 on order.



Photo: Laurent Guichardon/MBDA

The French Army MMP anti-missile system underwent cold weather trials at the Vidsel test range in Sweden in February 2019. By 2025 the French Army will have received 400 firing posts and 1,950 MMP missiles. Note the 'Tundra' pattern winter camouflage uniforms being used and the HK416F rifle.

emphasis was on improving living and working conditions for both the military and civilian defence personnel. Also referenced was a requirement to recruit more military personnel; 6,000 new personnel are required and their recruitment will see the first upturn in personnel numbers for some 30 years, according to the LPM. The LPM also called for defence modernisation through the acquisition of new equipment. As far as the French Army was concerned it noted that, "50% of the Army's new medium size armoured vehicles will be delivered between now and 2025." Also mentioned was the fact that 32 Nexter CAE-

SAR 155/52 mm self-propelled artillery systems will be delivered before the end of the LPM. The LPM also mentioned the 'capacity shortfalls' experienced by the French Armed Forces. This will, to a certain extent, be alleviated by the arrival of new equipment across the course of the LPM. Equally as important though is the increased attention being paid to the maintenance, repair and overhaul of existing equipment, and where necessary or practical, the upgrade of existing systems.

Bottom Up Modernisation

In January 2020, a number of small-arms acquisition related announcements for the French military were made by Le Ministère des Armées (MoD). They noted that the French Army had received the new F3 combat uniform and a new composite combat helmet is to be issued, with 25,000 to be delivered in 2020. New body armour is being issued, 37,000 sets were delivered between 2018 and 2019, with a total of 96,800 being delivered by 2025. Another important capability enhancement was the delivery of the first Thales O-NYX night vision goggles to the military, 3,179 units out of the 3,519 on order will be delivered this year, with the remainder due in 2021. A second major O-NYX order is due at a later date to fully equip the French military.

In terms of small arms, the French Army has had a number of modernisation programmes running since 2010. In December 2010, the Direction générale de l'armement (DGA) announced an order for the FN MAG 7.62x51mm machine gun to replace the existing French AA NF-1 system, with an initial order for 500 MAG being placed, with all of the weapons to be delivered in 2011. A second order was placed for 8,000 MAG in 2013, with the weapon being used in ground, vehicle and helicopter mounts.

The next step in the small arms upgrade effort was the DGA programme for the 'Arme individuelle futur' (AIF) to replace the existing FAMAS assault rifle that got underway in May 2014. This programme was funded under the LPM 2014-2019. Only European candidates were considered for the AIF requirement, and after a stringent evaluation programme, on 22 September 2016 it was announced that Heckler & Koch (HK) had been selected as the preferred contractor.

Over 100,000 rifles were to be acquired by the French Armed Forces, the majority of which, 93,080, would go to the French Army. Of these 38,505 were the HK416F-S version, with a 90 cm barrel. This variant would also be used with the HK269G (AG36) 40mm grenade launcher, 10,767 of which were ordered from HK. The majority of rifles for the French Army will be the

shorter HK416F-C version with an 80cm barrel. In total, 54,575 of these are to be acquired. First deliveries of the HK416F took place in 2017 and in 2020 a total of 12,000 rifles are due to be delivered.

The two most recent small arms acquisitions were announced in January of this year. The first of these was a new pistolet semi-automatique (PSA) or semi-automatic pistol. Tenders for the PSA were issued in March 2019 and after a competitive process the DGA awarded Glock a €44M contract for 74,596 Glock 17 Generation 5 pistols in 9x19mm NATO, with the ammunition being provided by Sellier & Bellot from the Czech Republic. Of the 74,596 pistols to be acquired, 80% will be delivered to the French Army, with the remainder going to the other services. First deliveries were made in late 2019 and all pistols are due to be delivered by 2022.

The other contract announced in January was for a fusil de précision semi-automatique (FPSA), or semi-automatic sniper rifle to replace the existing FRF2 system. The weapon selected for the FPSA requirement is the FN SCAR-H PR in 7.62mm NATO, 2,610 of these rifles have been ordered and 2,237 will be delivered directly to French Army units between 2020 and 2022. Ammunition for the new rifles will be supplied by MEN Metallwerk Elsenhütte GmbH. The weapons have a Schmidt & Bender telescope sight, with OIP Sensor Systems providing the night vision capability via their TIGRIS clip-on sights in two variants, one image intensifier and the other infrared.

Headline Programmes

The LPM provides a very useful analysis of the headline force objectives, in terms of numbers of key systems, that the French Army is aiming for at the end of 2025 as opposed to what it had in 2019. In terms of tanks there were 241 LECLERC available in 2019. The 2025 target is 200 LECLERC of which 122 will have been upgraded. Other major armour systems as of 2019 consisted of 250 AMX-10RC, 80 ERC 90, 629 VBCI, 2661 VAB and three GRIFFON. By 2025 the picture will be 150 AMX-10RC, 150 JAGUAR, 629 VBCI, 1545 VAB, 936 GRIFFON and 489 SERVAL. The acquisition of the JAGUAR, GRIFFON and SERVAL and the LECLERC upgrade are all under the auspices of the SCOPION programme.

Also noteworthy in terms of light armour is the VBL reconnaissance vehicle, 1,394 of which were in service as of 2019, including three upgraded vehicles. The 2025 fleet objective is for 1,387 VBL of which 733 will have been upgraded by ARQUUS to the ULTIMA configuration. Another reconnaissance asset that will be enhanced is tactical drone systems. According to the current LPM the



Photo: ARQUUS

The production line at ARQUUS of the VBL ULTIMA. French Army VBL reconnaissance vehicles are being refurbished and upgraded to the ULTIMA standard. By 2025, out of 1,387 VBL in French service, 733 will be VBL ULTIMA standard.

French Army had 1.5 of these systems as of the start of 2019. The system consists of the air vehicles, command and control units and support vehicles and infrastructure. The 2025 target is three tactical drone systems. Additionally communications assets are being upgraded, for example the Thales ASTRIDE theatre communications network. Artillery as of 2019 consisted of 77 CAESAR systems, 32 AUF-1 tracked 155mm self-propelled guns and 12 TRF1 towed 155mm guns, with there also being 13 MLRS fire units. The 2025 artillery park will consist of 109 CAESAR and 13 MLRS fire units. At the end of December 2019 the DGA placed an

order for the mortier embarqué pour l'appui au contact (MEPAC) system. This consists of a Thales 120mm 2R2M mortar mounted on an adapted GRIFFON vehicle. In total, 54 systems have been ordered, the first will be delivered in 2023, with the remainder delivered between 2024 and 2027.

Attack and reconnaissance helicopter assets available to Army Aviation in 2019 consisted of 164 helicopters, with 70 TIGRE and 94 GAZELLE. The 2025 objective is 147 helicopters, consisting of 67 upgraded TIGRE and 80 GAZELLE. The 2019 transport and utility helicopter fleet consisted of 36 NH90TTH, 52 PUMA, 26 COUGAR (including 24 upgraded)

and eight CARACAL. The 2025 objective is 115 helicopters, with 70 NH90, 11 PUMA, 26 upgraded COUGAR and eight CARACAL. French Army anti-tank capabilities are also being modernised via the arrival of the missile moyenne portée (MMP). MBDA delivered the first 20 firing posts and 50 missiles at the end of 2017, with the objective being the acquisition of 400 firing posts and 1,950 missiles by 2025. The MMP will replace existing anti-tank missile systems in the French Army such as MILAN, HOT and JAVELIN. With a range out to 5,000 metres, the weapon has seen operational service with the French Army in anti-terrorist operations in the Sahel. Apart from ground mounts, the missile will also be installed on the JAGUAR armoured vehicle, the replacement for the AMX-10RC and the ERC 90, and is also likely to be installed on the GRIFFON vehicle. The arrival of new equipment and the modernisation and upgrade of existing assets, along with the recognition of the need to increase defence spending, are extremely positive for the French Army. Any enhancement to the capabilities of the French Army can only be welcome, as France continues to play a key role in European defence and in international operations to confront terrorism and other threats to international order. ■

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Keeping Focussed: The French Air Force

Alan Warnes

In recent years, the French Air Force (FAF - Armée de l'Air), arguably the most operational of any air arms in Europe, has seen its resources stretched.

FAF assets are based all over the world these days in combat. In November 2018, the French Air Force Chief of Staff, General Philippe Lavigne, announced a new strategic plan he referred to as Flight Plan, ensuring the force remains "powerful, audacious, agile and connected." Referring to 'powerful' he meant keep-

tional MIRAGE 2000Cs, MIRAGE 2000Ds and RAFALEs regularly rotate aircrews through the OPEX, on two fronts, Africa and Middle East. At the same time, airborne nuclear deterrent requirements have to be maintained with the RAFALE. Unlike most air forces in NATO, the French is not shy to talk about this role.

mately 40 nuclear-capable RAFALE B Standard F3s based at Saint Dizier Air Base (Base Aérienne 113). After the retirement of the MIRAGE 2000N on June 21, 2018, the RAFALE B is the only aircraft now tasked with France's nuclear strike mission.

There are three ASMP-A sites, St Dizier, Istres and Avord, that house storage facilities known as K-Buildings, where the nuclear-capable RAFALE can operate from. The ASMP-A entered service in 2009, with a range of 500 km and a mid-life upgrade programme is scheduled to begin in 2022. Development of a stealthier extended-range weapon known as ASN4G (air-sol nucléaire 4ème génération) is expected to enter service in 2035. Among the ASN4G's propulsion options are hypersonic technologies, which may extend the length of the missile beyond what the RAFALE can currently carry. This will undoubtedly be a consideration for France's sixth generation fighter that was unveiled at Paris Air Show during June last year.

The RAFALE's relatively short range has meant that France's ASMP-A capability depends upon a supporting fleet of refuelling aircraft. It relies upon France's ageing fleet of 11 Boeing C-135FR and three KC-135RGs, some of which are now 60 years old, but the FAF is now making some progress into upgrading its tanker fleet. Two Airbus A330 MMRTs ordered in 2014, have now been delivered to BA125 at Istres le Tube. After a technical and operational evaluation campaign to develop the procedures for the aircraft by the CEAM (Centre du centre d'Expériences Aériennes Militaires), the first two Airbus A330 PHÉNIX as they are called in France, were declared operational in October 2019. Ten more ordered in December 2015, will be delivered by the end of 2023. They will serve with the Escadron de Ravitaillement en Vol et de Transport Stratégiques (ERVTS) 01.031 'Bretagne' at Isres le Tube.

On 3 October 2019, the A330 PHÉNIX was declared operational for the nuclear deterrent mission and is now an integral part of the strategic air force system. After a year of evaluation by CEAM using the first aircraft,



Photo: French Air Force

French Air Force RAFALEs are flying on the front line in the war against Islamic State, from the UAE and Jordan in Operation Chammal.

ing a nuclear deterrent, for 'audacious' read innovative, for 'agile' adapt to newer working environments and 'connected' means staying closer to the community. It is a modern outlook for an air force that is focussing much on newer technologies with French aerospace giants, like Dassault, Thales, SAGEM and MBDA. Today's FAF man Quick Reaction Alerts (QRAs) in France, the training needs of its 41,000 personnel, as well as overseas operations (Opérations Extérieures or OPEX). French Air Force wings operating conven-

Nuclear

France is proud of its powerful airborne nuclear deterrent, which comes under the responsibility of the Strategic Air Forces Command (CFAS) under the authority of the President. So it is not surprising, the CFAS is already making plans to replace the current ASMP-A (Air-Sol Moyenne Portée - Amélioré) weapon in the next decade. The ASMP-A is an air-launched land attack cruise missile that carries a nuclear warhead. In France, it is regarded as the warning shot before the employment of strategic nuclear weapons. It is one of six brigades that make up the Commandement des Forces Aériennes (CFA) or Air Force Command. CFAS operates two squadrons, EC (Escadron de Chasse) 001.04 'GASCOGNE' and EC 002.04 LA FAYETTE of approxi-

Author

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which arrived at Istres on 2 October 2018, the A330 MMRT was validated for use in the first nuclear operational capability. This will allow the PHÉNIX to carry out the nuclear deterrence mission from BA 125 and integrates intra and inter theatre refuelling and strategic transport capabilities. It is the first step to replacing the current old fleet of 3 KC-135RGs and 11 C-135FRs in operational use since August 1985. Some are nearly 60 years old. As a multirole aircraft, the A330 will also replace the Airbus A310 and A340 of the ET 3/60 'Esterel'. By 2023, the PHOENIX fleet should be able to deploy 20 RAFALEs in 48 hours. For now, the KC-135s soldier on working from very hot locations like Niamey in Niger as part of Opération Barkhane and Al Dhafra, UAE for Opération Chammal (see later).

RAFALE

The RAFALE F3s are now being upgraded to the F3-R standard, that reached initial operational clearance with the French Air Force on 6 December 2019. The enhancements include integration of the METEOR beyond visual range air to air missile (BVRAAM), laser-guided version of the Sagem Armement Air-Sol Modulaire (AASM) air to ground precision weapon, Thales TALIOS long range airborne targeting pod, Thales RBE2 active electronically scanned array (AESA) radar, an automatic ground collision avoidance system (GCAS) improved buddy-buddy refuelling pod and the Spectra electronic warning pod. In January 2019, Dassault was awarded the RAFALE F4 development contract, and marks the beginning of a new production version, with an initial 28 aircraft in the current F3-R configuration being upgraded. These initial aircraft will be delivered to the French Air Force from 2023. Another 30 additional RAFALEs are to be ordered and scheduled for delivery between 2027 and 2030.

The French Air Force Chief of Staff, General Philippe Lavigne discussed the RAFALE briefly at last November's Dubai International Air Chiefs Conference, "the F4 version will have new weapons [like the MBDA Mica NG air to air missile], sensors, radar and data link as well as increased artificial intelligence. The first example is expected to commence evaluation in 2022, with a formal entry into service around 2023."

Looking further ahead, the RAFALE will go through further enhancements to remain plugged in to tomorrow's integrated battlespace. This will include new systems to combat the latest air-defences and facilitate increased communications with other air assets, tactical units and ships. Lavigne continued, "the RAFALE will play a big part

in developing the New Generation Fighter within the Future Combat Aircraft System [FCAS]. So by 2030 we will have developed the F5 version and by 2040 possibly the RAFALE F6 – whatever that maybe."

Conventional Fighters

The Brigade Aérienne de l'Aviation de Chasse (BAAC) is responsible for all conventional air defence, attack and reconnaissance aircraft. The bulk of its assets are RAFALE C, MIRAGE 2000B/C, MIRAGE 2000D and MIRAGE 2000-5 as well as the TRANSALL C-160 Gabriel ELINT aircraft. There are three front-line fighter wings in the BAAC which are not only tasked with defending the air

squadrons, EC (Escadron de Chasse) 01.002 and EC 02.005 at Orange-Caritat (BA115) currently operating MIRAGE 2000B/Cs, although the latter will convert to the RAFALE during 2021-23. Another unit, EC 02.003, currently based at Nancy-Ochey flying MIRAGE 2000Ds in a training role will move to Luxeuil during 2020.

With just one squadron currently based at Luxeuil, there had been some concern over the future of the facility but last July, French Defence Minister, Florence Parly announced a RAFALE squadron would move into the base in 2032. Nancy-Ochey (BA133) hosts 3e Escadre de Chasse (3rd Fighter Wing), with three squadrons (EC 01.003, EC 02.003 and



Photo: Alan Warrnes

MIRAGE 2000Ds based at Nancy-Ochey have a very high operational tempo, with overseas operations in Africa as well as in France.

space of France but also deploying to the OPEX theatres.

In Operation Barkhane, the FAF is working with other allied countries in the Sahel region, Burkina Faso, Chad, Mauritania, Mali and Niger to tackle Islamic militancy. It has led to the detachment of two MIRAGE 2000C and two MIRAGE 2000D fighters/bombers to Niamey, Niger and three MIRAGE 2000Ds to N'Djamena in Chad.

While in the Middle East, the FAF's Operation Chammal sees up to four RAFALEs operating out of Muwaffaq Salti Air Base, Jordan and up to six based at Al Dhafra Air Base, UAE working alongside other allies fighting Islamic State and other militants in Syria and Iraq.

To illustrate the OPEX tempo, Op Barkhane saw in eight days (12-20 February) 132 sorties flown by the French Air Force covering 35 fighter missions, 46 ISR sorties and 51 transport or supply flights. Those based in Chammal carried out 56 aerial sorties. The fighters come from the three tactical air wings in the BAAC. Luxeuil St Sauveur (Base Aérienne 116) oversees two fighter

EC03.003) operating around 48 MIRAGE 2000Ds between them. The MIRAGE 2000D's main role is long range precision strike using conventional weapons like the MBDA Scalp-EG stand-off weapon. The loss of a two-seat MIRAGE 2000D from Nancy-Ochey in January, 2019, during a low-flying training mission highlighted the issue the FAF has faced with two big overseas operations. Both crew members were killed when the aircraft impacted the ground during a low altitude training mission. The subsequent report pointed to a lack of training for the 3rd Fighter Wing, which has endured several years of organic training deficit due to high engagement on operational theatres and low availability of the Mirage 2000D. "This lack of training led to an attempt to optimise each flight," says the BEA-É (Bureau of Enquiry and Analysis for State Aviation Safety - BEA-É), adding that "over the years, training has become increasingly dense." Steps have undoubtedly taken place to ensure such consequences do not happen again.



Mont de Marsan (BA118) is the home to 30e Escadre de Chasse and three RAFALE units (EC 02.030, EC 03.030 and EC 04.030) operating RAFALE B/Cs. The third unit is the Qatar Rafale Training Unit, training Qatari personnel on the jet before being delivered.

BACE

A second smaller command within the FAF is the Air Space Control Brigade (BACE), which is responsible for the four E-3F AEW&C aircraft at Avord (BA702) as well as the ground based radars, communication networks for France's airspace surveillance. A third command, the Aircraft Support and Projection Brigade (BAAP) is responsible for all transport and liaison aircraft and helicopters. The most recent addition to the fleet are two Lockheed Martin KC-130J refuellers ordered in 2017 and 2018 delivered to Orléans-Bricy (BA 123) in September, 2019 and February 2020 respectively. The KC-130J will allow the Air Force to air to air refuel H225M CARACAL helicopters to give them a greater reach and a complete capability unique in Europe. The FAF frustrated by the lack of progress with helicopter AAR work on the A400M opted for the KC-130J. They will be operated by the ET 02.61 transport squadron located at Orléans-Bricy and will spell the end of the AAR-equipped C160NGs. Colonel Stanislas Michel, commander of BA 123, said shortly after delivery of the first KC-130J: "This new KC-130J capability is important, especially for tactical air force missions with the CARACAL. We want to be able to implement this capacity in three months, that's the priority and it will be real asset for search and rescue missions."

Another new transport asset is the A400M ATLAS, of which the FAF has ordered 50. So far 16 have been delivered, with the 12th aircraft being the first tanker-equipped variant, to ET 01.61 at Orléans-Bricy. The other transport base is Evreux-Fauville (BA105) where the CN235Ms, C-160R TRANSALLs, and DHC-6 TWIN OTTERs are located. As



Photo: Alan Warnes

The French Navy ATLANTIQUE IIs based at Lann-Bihoué for maritime patrol duties are like most of France's front line aircraft, busy on several fronts.

part of the Franco-German cooperation on the C-130J, a bi-national training centre will be operational by 2021. France and Germany signed a deal in October 2016 to base a C-130J unit at Evreux.

The Air Defence and Operations Command (CDAOA) is responsible for the ongoing monitoring of national air space under the authority of the Prime Minister. In addition, the Chief of the Defence Staff is tasked with the planning, conducting and monitoring of air operations.

Navy

The Aéronautique Navale (Fleet Air Arm) has gone through a fundamental modernisation programme in recent years. Its main air base Landivisau now hosts three RAFALE M F3/F3R squadrons, Flotille 11F, 12F and 17F. The Navy has ordered 48 RAFALE Ms against an original requirement of 58. All ten of the F1 versions were rebuilt to F3 standard between 2014 and 2017, while all 14 surviving F2 jets were upgraded to F3 standard by 2011 and all 42 existing F3 standard aircraft are now being upgraded to F3-R configuration (see Air Force). Four aircraft have been lost to date, the most recent in July 2012.

The first upgraded F3-R version was delivered to the Navy in December 2018 and made its first flight on 17 December 2019. The first operational sortie came on 29 January 2020, when the latest configuration of

the RAFALE flew from the Navy's CHARLES DE GAULLE aircraft carrier. The purpose of his mission was to collate data in the Syrian skies for the international coalition fighting against the Islamic State in Middle East. This marked the first operational missions for the RAFALE M in its latest standard over Syria.

Other roles still to be modernised include the Avions de Surveillance et d'Intervention Maritime (AVSIMAR, Maritime Surveillance and Reaction Aircraft) to streamline the various special mission configurations of the Falcon 50 and 200. On 19 November 2018, the French Direction Générale de l'Armement (DGA) announced a one-year study on the AVSIMAR. The aircraft should fulfil several missions, including Intelligence, Surveillance and Reconnaissance (ISR), Search and Rescue (SAR), Anti-Surface Warfare (AsuW) / Electronic Warfare, Maritime Reconnaissance (MR) and Reconnaissance and Over-The-Horizon Targeting (OTHT), Electronic Intelligence (ELINT), law enforcement, piracy control, fishery patrol, drug interdiction, environment protection, medical evacuation and personnel and light equipment transportation!

Last September, the French Defence Minister, Florence Parly announced that the Northrop Grumman E-2D airborne early warning (AEW) aircraft had been selected to replace the E-2C HAWKEYEs upgraded to HAWKEYE configuration in 2000.

The Navy has ordered 27 NH-90 helicopters that will lead to the withdrawal of the Leonardo LYNX HAS 2/4s this year. The NH-90s will come in two configurations – the 13 NHS-90 CAIMANs are in support configuration, while the 14 NHC-90s are combat versions. Not all of the latter have been delivered yet.

The Navy like the air force is also involved in France's OP, with one ATLANTIQUE 2 based in Niamey, Niger and another at Al Muwaffaq Salti Air Base in Jordan. The CHARLES DE GAULLE aircraft carrier is also currently in the eastern Mediterranean until April, to support Operation Chammal in the Middle East. Once leaving theatre, it is expected to head to the Atlantic Ocean and North Sea for further training.



Photo: Alan Warnes

The ageing Boeing C-135FR refuellers are set to be phased out over the next few years as more A330 PHÉNIX are delivered.



Record Year for Arquus

Gerhard Heiming

In its second year after being renamed Arquus, the company enjoyed a record fiscal year in 2019. At a press conference in Paris at the end of February 2020, President and CEO Emmanuel Levacher explained the key figures for the past year and the targets for the current one.

In more than a hundred years, Arquus has grown through merger and integration to become the group it is today. Brands such as RVI, SAVIEM, ACMAT, Renault Trucks Defense, Panhard Defense and Mack Defense were integrated and merged to become Arquus in May 2018.

Key Sales Figures

The successful FY2019 reported a 38% increase in revenues compared to 25% in FY2018. According to unofficial figures, revenue in 2019 was over €600M. Arquus was able to book new orders worth €1.2Bn last year, including €750M in firm orders. This results in an order backlog of €5.8Bn. The largest customer, accounting for 58% of revenue, is the French Army. In addition to the procurement of vehicles, about one third (with an increasing trend) is invested in maintenance and vehicle repair. The most important export destinations are Kuwait, the G5 Sahel Zone (including Mauritania, Mali, Niger, Burkina Faso and Chad) and Canada. The rise in sales is reflected in an increase in the number of vehicles produced. In 2019, 2,156 military vehicles of all classes were delivered to users, including 65 VAB MK3, 1,276 MSVS, 223 SHERPA Light, 500 TRAPPER and 92 GRIFFONs. This represents a quantitative increase of around 47% over 2018.

Selected Programmes

For the production of the 6x6 GRIFFON multipurpose vehicle (Véhicule Blindé Multi Rôles, VBMR) and the 8x8 JAGUAR armoured reconnaissance and combat vehicle (Engin Blindé de Reconnaissance et de Combat, EBRC) under the French Army's Scorpion armament programme, Arquus is part of a consortium consisting of Arquus, Nexter and Thales.

In July 2019, the first GRIFFON 6x6 multipurpose vehicle was handed over to the customer and the logistics platform for SCORPION was put into use. Until December 2019, 92 GRIFFON were delivered and a first operational unit of the French Army was initially equipped with three GRIFFON.

In December 2019, another 54 GRIFFON mortar carriers and 262 additional HORNET remote-controlled weapon stations for GRIFFON were ordered to be delivered in 2023. In addition, the first SCORPION export order was completed: Belgium has ordered GRIFFON and JAGUAR vehicles worth €1.5Bn for delivery from 2025, and Arquus accounts for €214M of this sum.

In 2019, Mack Defense completed the delivery of 1,587 logistics trucks to the Canadian armed forces. For the Medium Support Vehicle System (MSVS), 8x8 trucks and trailers were delivered in various configurations, including bullet and mine protection kits. As part of the treaty with the G5 states of the Sahel region, which is intended to strengthen the African armed forces, Arquus last year supplied 61 protected passenger transport vehicles BASTION with weapon station and 84 logistics vehicles last year.

Targets for 2020

In addition to the planned production of 128 GRIFFON the SCORPION programme will see another milestone: The first four production vehicles of the protected 6x6 reconnaissance and combat vehicle JAGUAR will be handed over to the customer.

The production of the HORNET T1 weapon stations will be expanded. Following 41 units last year, 100 units could be completed this year.

For upcoming official presentations, Arquus is preparing two highlights. The light, protected SCARABÉE reconnaissance vehicle with hybrid electric drive will be geared to the export market. The concept allows both pure electric and pure diesel propulsion. Powerful batteries will allow for crawl speed while maintaining full functionality of the extensive sensors and communications. As a matter of fact, there will be no tender in France before 2025. Arquus must raise funds for the further continued development of the vehicle, including offering for export, in order to be able to present an even more sophisticated vehicle for France in a few years' time.



The highly mobile hybrid-electric SCARABÉE is destined for the export market.



The new family of logistics vehicles is designed to meet the requirements of the French armed forces.

The new development of an 8x8 logistics truck introduced in October 2019 represents a new family with 4x4 and 6x6 versions. The trucks cover a payload range of three to fifteen tonnes. The capabilities and features of the new truck family are designed to meet the needs of the French Army, which plans to replace part of its current truck fleet before the end of 2020.

Arquus expects to increase sales by around ten percent by 2020. With the planned moderate increase, the company intends to stabilize its organisational structure after a two-year phase of rapid growth.

The Army Warfighting Experiment

The UK Army Investigates Future Technologies

David Saw

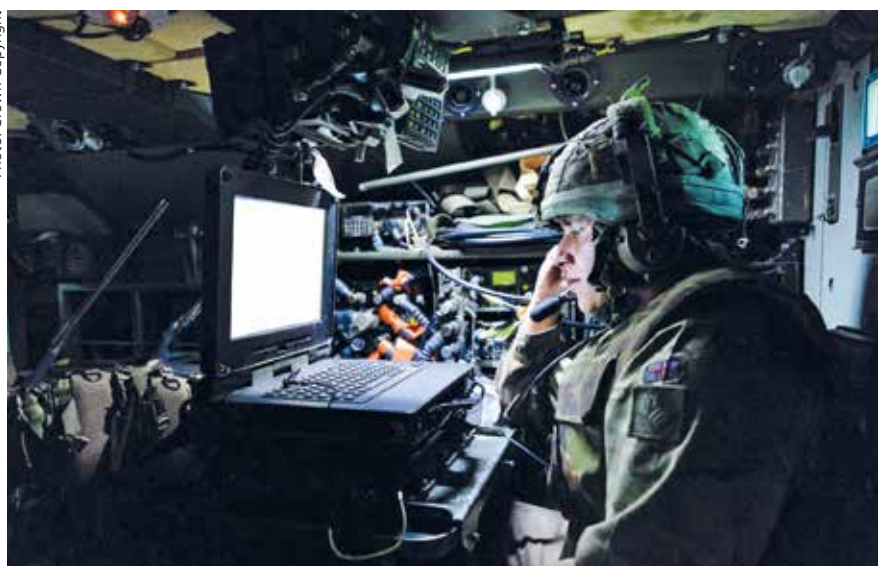
We live in a world where rapid technological change has become the norm. However, this process of technological evolution/revolution brings a host of problems in its wake. For the military, this process of change offers both possibilities and perils, advanced technologies, or more precisely 'disruptive technologies' need to be identified, investigated and then utilised correctly.

For the UK Army, it is their Army Warfighting Experiment that will help them to manage the identification, investigation and utilisation of these new technologies. Since the end of the last major war in Europe in 1945, the UK Army has experienced few, if any, years when its units were not in combat somewhere in the world. If not in combat, UK troops were often also employed in peacekeeping/peacemaking missions. The UK Army has honed its skills in diverse environments. Classic counter insurgency missions became a consistent theme and considerable expertise was developed in this area.

For the majority of the post-1945 era, the key mission of the UK Army was to fight a high-intensity conflict, perhaps nuclear or perhaps conventional, in northern Germany. It was the NATO Europe mission that was central to defining the UK Army. Then, the Cold War ended and more than 40 years of operational certainty were swept aside. The post-Cold War world was a very different place. These new circumstances were being confronted at the same time as military budgets were contracting, making adaptation to change even more difficult.

In the post-Cold War world, the military picture would be all about rapid intervention, peacemaking, peacekeeping and humanitarian missions. High intensity conventional conflict was unlikely. You would, therefore, not need the expensive to acquire and operate equipment best suited for those conflicts. Almost inevitably, the strategic and operational circumstances projected for the future turned out to be less than realistic. Instead, western militaries have found themselves embroiled in years of asymmetric conflicts in multiple locations around the world. And then, adding further difficulty to the operational environment, came the realisation that high-level conventional threats were once more emerging as a real possibility.

Photo: Crown Copyright



UK troops participating in a multinational NATO exercise demonstrating interoperability as part of a joint task force. The UK Army is placing a lot of emphasis on Agile C3 at the present time, hence it became the central theme of the 2020 Army Warfare Experiment (AWE).

Technology Challenge

All of this means that we have a multi-faceted threat environment to deal with. In itself, this would be challenging, but being realistic, complex threat environments are nothing new and can be adapted to. What is different today is that we live in an era of disruptive technologies, where the pace of technological change is so intense that new possibilities emerge and rapidly become utilisable and widespread in a short period of time. Advances in computers, communications and networks have had, and will continue to have, a transformative effect on society. Yet, as our dependence grows on new technologies, it has also become apparent that these technologies have vulnerabilities. All of which means that while embracing the possibilities offered by new technologies, we cannot afford

to lose focus on the need to ensure that these systems are secure.

Another area to take account of is that of analytical tools can provide the ability to gather, process and distribute information far faster than a human can. Increasingly, we are entering the era of artificial intelligence. While this promises great possibilities, it will, in turn, force questions to be asked about how this technology is to be used and what consequences it could have for society in a broader context. It is also worth noting how advanced technologies can be turned into a social control mechanism, for example, the 'social credit' system being introduced in China. Here, big data is used to determine how trustworthy a citizen person is, in terms of their loyalty and commitment to the state. China already utilises another big data system for mass surveillance as a part of their state security apparatus.

As previously noted, the constant advance of technology and the capability growth that comes along in parallel offers immense possibilities and challenges. For the military, one of the challenges of this new technological environment is that the pace of this change is running far faster than traditional procurement processes. Traditionally, the procurement cycle was as follows: military defines what it wants, it puts its requirement out to industry, the industry responds, the military tests what is on offer and then eventually acquires a system that meets its requirement and that system is eventually fielded.

The problem is not just the time consuming nature of the procurement cycle; there are also issues with military Research and Development (R&D) programmes as well. Put simply, government/military-funded R&D pales into insignificance compared to what is happening in the civil sector. This is not a phenomenon confined to Europe or even the US. China has recognised the issue and has sought to confront it with a strategy called Military-Civil MCF. Here, the military works with research universities and small companies to develop and utilise technologies and systems. The MCF programme also sees larger defence companies being encouraged to work with research universities and private industry.

UK Experiments

The UK Army was well aware of the disruptive effect of modern technology, but decided that they had to take a more focussed approach in dealing with challenges involved. They would identify key areas of interest in the short to medium-term and then invite potential suppliers from major corporate firms, smaller companies and even individuals to submit their solutions to meet identified needs. This process became known as the Army Warfighting Experiment (AWE).

Experimentation with advanced technology is nothing new for the UK Army. In 1927, they established the Experimental Mechanised Force (EMF), a brigade-sized unit, to investigate armour and mechanised warfare covering techniques, doctrine development and identifying the necessary systems and equipment. This process lasted until 1934, when an unholy alliance of military conservatism and lack of funding killed the experimental programme. Although the current series of AWE efforts might not be as ambitious as the old EMF, they will likely result in capability being delivered to the end user far more rapidly than the conventional procurement process. The AWE is also quite broad in its scope covering all sorts of systems and equipment from simple low cost solutions on upwards. The 2017 iteration of AWE saw 275 submissions from industry and other interested parties. These were then reduced to 72 submissions that would be utilised in the AWE. Amongst the items tested were a self-sterilising water bottle, micro-drones and 18-metre manportable EasiBridge infantry bridging system.

Then came AWE 2018, also known as Exercise Autonomous Warrior. This was a four-week field exercise on Salisbury Plain Training Area in November/December 2018. Apart from UK forces, a US Army Experimental Force Platoon also took part in the exercise. The focus of AWE 2018 was Robotic and Autonomous Systems (RAS). In total, 122 industry submissions were received and 50 were accepted. The objective was to see how RAS could



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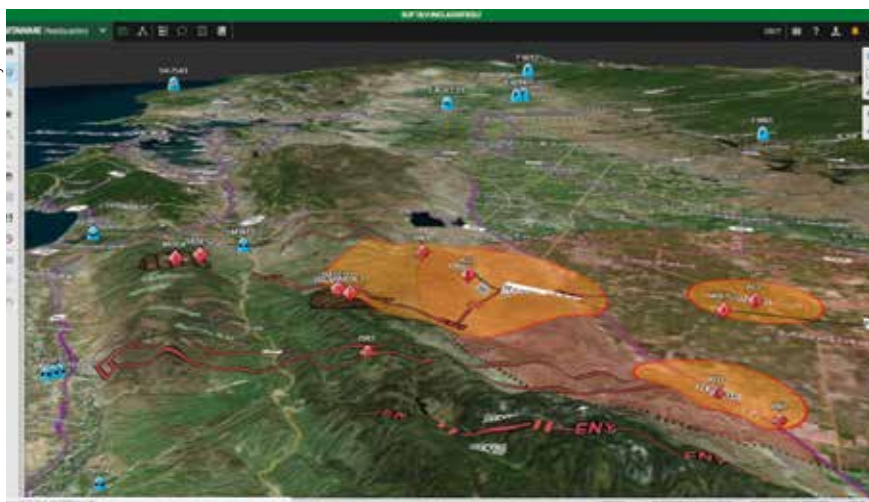
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A 3D map generated by the Systematic SitaWare Headquarters command and control software. SitaWare is in use by 30 different countries and provides the backbone for the US Army Command Post Computing Environment. It is also used by the Allied Rapid Reaction Corps in Europe.

add to situational awareness and decision support, movement and manoeuvre, firepower, force protection and sustainability. Autonomous Warrior would also build on data gathered during the Royal Navy Unmanned Warrior exercise in 2016, where RAS systems operated in maritime environment conducting reconnaissance, surveillance and mine counter-measures missions.

At the outset of Autonomous Warrior, the idea was "to identify how the Army can exploit developments in RAS technology through focused analysis, capability integration and experimentation to deliver affordable operational capability in the short-medium term." From an Ar-

my perspective, they will achieve "novel engagement with industry, academia and other government departments." This will help capability and concept development, assist in refining military requirements, help industry to understand military requirements and develop products via user trials, experimentation and feedback.

One area that Autonomous Warrior was keen to explore was in improving the effectiveness of Combat Service Support, in particular the ability of RAS systems to deliver ammunition and supplies to troops on the front line. Another aspect of the exercise was to investigate how the agile command and control of dispersed

forces could be enabled. After AWE 2018 came AWE 2019, which had the theme of Manned-Unmanned Teaming. Then, in 2019, work started on putting together the structure for AWE 2020, which would have Agile C3 as its central theme and will mark a decade of AWE activity.

Forward to AWE 2020

According to the official statement regarding AWE 2020, "Agile Command, Control and Communications (C3) has been identified as one of the nine fundamental deductions and insights judged most critical to guide strategic, joint and command force development." AWE 2018 had an Agile C3 element. The fact that Defence Equipment & Support (DE&S), responsible for the procurement of systems and equipment for the UK military, and the UK Army wanted to return to work on Agile C3 illustrates its importance to near and medium-term operations. AWE 2020 is expected to be a bigger affair than AWE 2018 both in terms of numbers of companies and other participants, featuring a far greater level of involvement.

The idea for AWE 2020 is to look at all aspects of battlefield headquarters from deployable infrastructure, data aggregation and analytics to HQ resilience and decision support. What the Army wants to do is to "engage with industry technology providers of all sizes to explore what innovative approaches to traditional issues can be leveraged to give the army a competitive edge." It then wants to "expose capability and knowledge gaps" and "explore technology ready for rapid exploitation." They also want to "create a community of industry partners that will encourage a collaborative approach to problem solving." The latter is an important point. The Army is not wedded to acquiring an 'own brand' solution from a single contractor. Instead, they want to see industry teams forming to offer 'best-in-class' solutions to meet their requirements hence words like 'community' and 'collaborative approach.'

Turning to practicalities, the objective of AWE 2020 is to answer five main questions within the context of the overall Agile C3 environment. They want to know what technology can do to help them "improve data exploitation for situational awareness and understanding." They want technology to allow them to make 'faster and better informed' decisions. As regards Headquarters, they want to "reduce the detectability and improve the resilience and agility of HQs at all levels in

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UK troops on exercise on domestic soil prior to a foreign deployment. The UK view is that the current threat environment is highly diverse and unpredictable, fuelled by rapid technological change amongst other things. Data gained in the AWE helps the UK Army to modernise to confront evolving threats.

order to enhance their survivability.” Also required are methods to allow for more efficient deployment and employment of HQs on operations. Finally, they are looking to improve command on the move and find the means to make dispersed HQs a reality. As with AWE 2018, AWE 2020 will feature a month-long field trial where industry solutions to the Agile C3 problem will be tested by the military. How a company involves itself in the AWE environment is an interesting process. For the UK arm of Systematic, a Danish company specialising in software and systems integration with defence plus intelligence and national security being two of their five core business areas, they had participated in an earlier edition of AWE so were fully aware of what was required. When the scope of AWE 2020 was revealed, Systematic noticed areas that were extremely relevant to their capabilities and decided to submit a proposal to the AWE 2020 team to demonstrate what they could offer. While this was happening, they became aware of other companies who intended to become involved in AWE 2020 with whom they could potentially work, and this eventually led to a partnership with another company for participation in AWE.

For AWE 2020, Systematic, working as part of a larger team with a major communications prime, are intending to demonstrate their command and control software. In AWE, they will be demonstrating C3 capabilities in a satellite-denied environment, utilising their SitaWare Headquarters and Frontline systems over HF communications. The environment for this will be a UK Army Battalion HQ

linking to a multinational HQ. As might be imagined, SitaWare Headquarters is a command and control software for HQ applications, while SitaWare Frontline is a command and control software for mounted units.

One important aspect of what Systematic are offering is that their command and control solutions will be interoperable with other systems, essential in a multinational operational environment.

The UK Army has said that it is committed to modernising its capabilities and concepts, determining that this is essential due to the rapid pace of technological change and the highly diverse and unpredictable nature of current threats. The AWE series of events has emerged as a way for the UK Army to pursue its modernisation agenda through identifying systems and ideas from industry and other sources that can be utilised to



Photo: DE&S

In the 2018 edition of the AWE the UK Army was focussed on RAS. The field element of AWE 2018, Exercise Autonomous Warrior, saw RAS equipment such as this device from MILREM Robotics demonstrated.

Systematic also note that their solutions use an open, modular architecture and that they can provide a software development kit to their users and others, allowing a customer to develop a 'bespoke' command and control 'app'.

meet its needs. For the industry, AWE presents an invaluable means of interacting with the end-user community, allowing the development of systems to meet both UK and international requirements. ■

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Distracted by Uncertainty: Malaysia's Defence

Dzirhan Mahadzir

The direction of Malaysia remains uncertain following the collapse of the Pakatan Harapan Government and coalition on 24 February 2020, following the pull-out of one key coalition partner.

Fundamentally though, there has been no sign of any unrest despite this development – even though it may largely also have to do with the public's weariness of the constant politicking that had been ongoing even prior to the 2018 General Election. At the same time, the country's civil servants and military and security forces are going about their duties as usual though naturally certain aspects that required ministerial authority remain in limbo as only Prime Minister Mahathir Mohammad (who resign and was reappointed by the King as interim Prime Minister) is in office, with all other Ministers and Deputy Ministers having been forced to relinquish their positions with the collapse of the government.

Malaysia's system of checks and balances, in the form of a constitutional monarchy, ensured that no political party can claim or usurp power particularly with the military owing allegiance to the reigning King. Even the King himself, in contrast to neighbouring Thailand, does not have absolute authority as the position is rotated among the nine hereditary sultans of nine of the 13 states in Malaysia (the remaining four having no hereditary sultanate) who elect one of their numbers to rule as the King for a five-year term.

This unique system has prevented any one individual, be it politician or royalty, from accumulating an overwhelming influence on government, military and security institutions. Though the Armed Forces oath of loyalty is to the King and the King is their Supreme Commander and all officers hold a King's commissions, promotions and ad-

Photos: Dzirhan Mahadzir



With the disbandment of the National Special Operations Force in 2018, the counter-terrorism role has reverted back to the Royal Malaysian Police Unit Tindak Khas.

vancement are determined by the Armed Forces Council, which is comprised a mix of civilian, military and a representative of the Council of Rulers, which represents the nine Sultans and thus again ensure an officer corps not beholden to any particular individual. This has ensured that throughout its history, Malaysia has been free from any interference from the military in domestic politics. As such, where in other countries, the collapse of a government would be the prelude to a military coup, this is not the case in Malaysia. Instead, the country is going about its daily routine while the politicians wrangle among themselves.

Eastern Sabah Security

Still, while internal security has not been a problem, the issue of Malaysia's defence against external threats has been one that has not fully been addressed by the both the previous Barisan Nasional and Pakatan

Harapan governments owing to the continuing politics in the country and pressing domestic issues. Fiscal issues and the lack of priority on defence spending were also among the problems but both governments considered defence to be somewhat of a lower priority though neither government could be blamed for such given the sluggish nature of the economy and the need to spend on public programmes to address the fiscal difficulties faced by the public in regard to the economy and the increasing cost of living. Both governments prioritised security in East Malaysia, the Barisan Nasional government creating the Eastern Sabah Security Zone and Eastern Sabah Security Command (ESSCOM) (comprising of the Malaysian Armed Forces, Royal Malaysian Police and the Malaysian Maritime Enforcement Agency - MMEA) in the wake of the 2013 Sulu Incursion in Eastern Sabah and the following spate of cross border kidnappings that followed

Author

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The National Special Operations Force unit combined personnel from the special forces of the Malaysian Armed Forces, Royal Malaysian Police and the Malaysian Maritime Enforcement Agency into a unit designated as the prime response unit to any terrorist incident. The Pakatan Harapan Government deemed the unit superfluous and disbanded it in 2018.

after that, which set in motion plans for the deployment of additional military and police units to the area along with the establishment of new units to be stationed in the area.

This was also accompanied by the establishment of new bases, commands and procurement and deployment of additional surveillance radars as well as other equipment to the area. An agreement was also implemented with the Philippines and Indonesia to establish coordinate sea and air patrols in the Sulu and Celebes Sea in the form of the Trilateral Maritime Patrol and Air Patrol arrangements. The Pakatan Harapan government, which came into office in 2018, largely continued with the same plans save for a minor restructuring of ESSCOM's command structure. However, neither government came up with any permanent solution to the problems posed by armed groups conducting cross border kidnappings beyond constant vigilance, increased presence and capabilities and patrols and the restriction of movements coupled with curfews in certain areas. In short, both governments felt that an ongoing security posture of patrols and vigilance would be sufficient to intercept any attacks and, at the same time, deter any intrusion. The current commander of ESSCOM, Deputy Commissioner of Police Hazani Ghazali told the media on 26 January that since 2018, ESSCOM had foiled 40 attempted kidnapping attempts resulting in only two kidnappings incidents in both 2018 and 2019. It is expected that whatever government comes into power will continue with the same approach.

Terrorism Response Restructuring

Under the Barisan Nasional government, a new special operations unit known as the National Special Operations Force (NSOF)

was established on 27 October 2016 as the response unit to terrorist incidents. The move to establish the NSOF was part of an overall restructuring of Malaysia's security laws and apparatus by the then government to better deal with the threat of IS militants. The then Defence Minister Hishamuddin Hussein stated in Parliament that NSOF would be geared towards combating specific threats, chief among those being the threats posed by IS militants. NSOF comprised of personnel from the special operations forces of the Royal Malaysian Police, all three services of the Malaysian Armed Forces and the Malaysian Maritime Enforcement Agency (MMEA), namely the Royal Malaysian Police's Unit Tindak Khas special action unit and VAT 69 commando unit, Malaysian Army's Grup Gerakhas special forces, Royal Malaysian Navy PASKAL, Royal Malaysian Air Force PASKAU and the MMEA Special Task and Rescue team. The unit comprised of 187 personnel though all personnel were on attachment from their parent units as the Civil Service, which was the deciding authority on all government

personnel positions, had yet to approve the increased personnel appointments to the NSOF. However, the Pakatan Harapan government which came into power in May 2018, disbanded the unit in July 2018 as part of its move to shut down excess government departments and agencies and reverted back to the Royal Malaysian Police's Unit Tindak Khas. This unit had the duty of being the prime responder to any terrorist incident, with special operations forces of the three services of the Malaysian Armed Forces supporting them, if required, as was the case prior to the establishment of the NSOF. As the previous government had yet to formalise appointments for the formation, which also left parent units shorthanded and unable to replace personnel since they were still considered part of their original unit, the Pakatan Harapan government was able to easily disband the unit and return personnel to their parent formations. Throughout its establishment, the NSOF did not have to respond to any incident.

Defence White Paper

The Pakatan Harapan government released the country's first Defence White Paper (DWP) in December 2019 in Parliament, which was subsequently approved by both houses of Parliament in the same month. The document stated it would guide Malaysia's Defence direction for the next decade. However, whether it will survive any change of government is open to question. To a large extent, the DWP did not put forth anything definitive and a fair portion of it was little different than what was already stated in the 2010 National Defence Policy. The DWP outlined the capability requirements for the Armed Forces but gave no indication as to what time frame were these capabilities to be



In relation to the F/A-18 HORNET of the Royal Malaysian Air Force, the Malaysian Defence White Paper issued in 2019 states an intention to acquire ten more aircraft to supplement the eight already in service.

achieved and exact details on what would be done to acquire these capabilities. Fundamentally, no mention was made of how much these capabilities would cost and whether there was funding available. Matters were not helped by the Government also contradicting itself after the issuing of the DWP. The DWP mentioned the Royal Malaysian Navy's 15 to five Plan and the Royal Malaysian Air Force Capability 55 plans as long term development plans for both these services. However, the Deputy Defence Minister Liew Chin Tong stated in the Senate on 16th December 2019 that as the RMAF CAP 55 development plans was not recognised by the Ministries of Economic Affairs and Finance a new and recognised development plan would have to be developed.

The DWP also appeared not to acknowledge ongoing issues like the troubled MAHARAJA LELA class Littoral Combat Ship (LCS) programme, stating that the ship class would be one of the main RMN assets. Based on the Naval Group GOWIND design, the six 3,100t ships incorporates stealth characteristics and carries an armament of a single BAE Mk3 57mm gun in a stealth copula, 2 MSI SEAHAWK 30mm guns, two launchers for the Kongsberg Naval Strike Missile anti-ship missile (each with four missiles), a 16 cell SYLVER Vertical Launch System for the MBDA Mica surface to air missile and two J+S Marine triple torpedo launchers. Its electronic systems include the Thales SMART-S Mk 2 3D surveillance radar, Rheinmetall TMX/EO Mk 2 fire control radar, Rheinmetall TME0 Mk 2 electro-optical tracking systems and Thales CAPTAS Mk 2 variable depth sonar. The Combat Management System is the Naval Group SETIS system. The original schedule for the LCS programme was for a first of class delivery in 2019 with all six ships delivered by 2023. However, on 29 October 2019, Defence Minister Mohamad Sabu disclosed in parliament that the first of six ships will not be delivered until 2023 instead of its originally planned date of April 2019. He did not give reasons for the delay, only stating that if detailed weaknesses were revealed, it would result in a lack of confidence in Malaysian companies. He also said that the six-ship contract, which runs from 3 October 2013 to October 2023, had a ceiling of €1.96Bn and, at 30 September, the programme was 55.7% completed in contrast to a projected milestone of 78%. The delay also resulted in shipbuilders Boustead Naval Shipyard requesting an additional €301M over the original contract ceiling in order to complete the ships. While Minister Sabu reiterated the government's commitment to the programme, at the



The Malaysian Maritime Enforcement Agency (MMEA) patrol vessel KM BAGAN DATUK is one of the newer MMEA assets, entering service in 2017; a total of six ships have been ordered.

time of the government's collapse, no decision had been made yet on the additional funding for the ships.

Similarly, the DWP talked about the Littoral Mission Ships (LMS), and cited the ships modularity and plans to acquire additional ships. However, the current four 68 metre KERIS class mission ships (one delivered, another to be soon delivered and two more to be constructed) built by China Shipbuilding International Corporation do not have any container mission modules that were originally envisioned by the RMN to equip the ships allowing it to operate in various roles when required. The mission modules were to have been developed separately but none were contracted for or developed. The DWP was not clear as to whether its reference to the LMS was specifically in regard to the KERIS class or a generic term in which different designs would be contracted for but all would be classed as LMS. The Pakatan Harapan government had been contractually obliged to continue with the four KERIS class contracted for by its predecessor but indications were that no more would be contracted for given China's claims in the South China Sea which included parts of Malaysia's EEZ. As it is, even the delivery of the second KERIS class LMS, Sundang is open to question as the ship is scheduled to be handed over in April this year but owing to the Coronavirus, the RMN's potential crew for the ship, who had been undergoing training in China and then returned to Malaysia during the Chinese New Year holidays, have yet to return there to complete their training in preparation to sailing the ship home.

The third and fourth KERIS class LMS have yet to be constructed but are scheduled to be delivered in mid-2021 but with the shipyard building them being in Wuhan, the epicentre of the Coronavirus, it is expected that construction and delivery of these two ships will be delayed given the circumstances.

The DWP also made no mention of the much delayed Multi-Role Combat Aircraft replacement for the already phased out MiG-29s. Instead, it only stated that a new fighter would replace the F/A-18 HORNETs and Su-30MKMs in the timeframe of the 14th (2026-2030) and 15th Malaysia Plan (2031-2035) and priority would be given for the Light Combat Aircraft programme, although it put no timeframe on when that would be done. A small footnote mentioned that the RMAF was seeking to increase the current strength of eight F/A-18 HORNETs to a full squadron of 18 in the timeframe of the 12th Malaysia Plan (2021-2025).

The DWP also placed emphasis on developing the local defence industry with five initiatives namely:

- Enhancing the economic strategic framework for defence science, technology and industry, focussing on niche sectors;
- Restructuring organisations related to the defence industry;
- Establishing a Defence and Security Investment Committee;
- Stimulating Research and Development and innovation through sustainable funding;
- Strengthening talent development programmes.



The Littoral Combat Ship MAHARAJALELA seen here at its launch ceremony in 2017. However, due to delays in the programme the ship will only be delivered in 2023 instead of its scheduled 2019 delivery.

However, these were all generally outlined and it was stated that specifics on these initiatives were being considered and discussed. With the government's collapse, it will be some time before these matters will be worked on, particularly as whoever becomes the next government will have to consolidate their position and then focus for a general election scheduled for no later than May 2023. Given that the norm is already for the country to be already in preparation for an election by one year earlier, it is expected that any defence policy change will be on hold by 2022. As a whole, the DWP did not really introduce anything new towards Malaysia's defence strategy. Instead, it was more or less a continuation of the same thing.

In January 2019, the then Chief of Defence Force General Zulkifli Zainal Abidin announced that the Malaysian Armed Forces would be establishing a Joint Special Forces Command and Joint Area Commands to better coordinate and command Malaysian Armed Forces activities in the areas where these commands were established. However, by the time of his retirement, on 1 January 2020, much had appeared to be done in establishing any of these and it remains unclear whether whichever government Malaysia gets will see a need to go ahead with these.

Coastguard and Police

In 2018, the Pakatan Harapan government transferred the purview of the MMEA, also known as the Malaysian Coastguard for the Prime Minister's Office to the Minister of Home Affairs as part of its restructuring to cut down the number of government agencies overseen by the Prime Minister's Office. While the MMEA has been slowly building up its capabilities, its resources are limited due to budgetary limitations. The MMEA Annual Report 2017 was the last annual report that gave a breakdown of its asset strength while subsequent

reports made no entries on it. The 2017 report lists the MMEA as having 277 sea assets and 8 air assets, although going on to state later on in the report in regard to sea assets as of 31 December 2017, 234 were operational, 5 were undergoing repair, 14 were non-operational and 24 were in 'mothball' status.

Unfortunately, the report did not breakdown the exact sea assets types and status. However, at a glance, while 234 operational sea assets appears numerous, many of these assets are actually small boats of which a fair number are only suitable for close in-shore work. Many of these sea assets are a collection of previously operated craft belonging to Malaysian enforcement agencies, which used to carry out their own maritime enforcement operations and operate their own fleet of boats prior to the government directing that the MMEA would be the main agency to carry out maritime enforcement and all agencies were to turn their ships and boats over to the MMEA but their personnel would be on board MMEA ships to conduct specific operations and provide subject matter expertise in such.

The number of assets capable of patrolling Malaysia's EEZ is limited to a handful of ships, namely the two LANGKAWI class OPVs (75m, ex-RMN MUSYTARI class, entered RMN service in 1987 and transferred to MMEA in 2006), the OPV KM PEKAN (92m, ex-Japan Coast Guard JCG ERIMO, transferred to MMEA in 2017), OPV KM ARAU (87m, ex-JCG OKI, transferred to MMEA in 2017), the training/patrol ship KM MARLIN (40m, new built ship completed in 2006 and donated by Nippon Foundation in same year), three BAGAN DATUK class New Generation Patrol Craft (45 m Fassmer design locally built, three delivered and in operation from 2017 with another three to be delivered), two PERWIRA class patrol craft (38.2 m, ex-Australian Customs Bay class transferred in 2015), a total of 10 ships rising to 13

once the remaining BAGAN DATUK class enters into service. Three 83m OPVs are being built locally, based on the Damen 1800 design with the first ship scheduled to be delivered around late 2020 to early 2021. The MMEA has the prime responsibility for conducting Search and Rescue Operations in Malaysian waters and coordinating with others, such as the Royal Malaysian Navy, Royal Malaysian Air Force and Royal Malaysian Police Air Wing and Marine Police on such operations.

Illegal fishing in Malaysia's EEZ has been a major concern with the government establishing a multi-agency task force comprising of the MMEA, RMN, Royal Malaysian Police, fisheries department, fishery development authority of Malaysia, Immigration Department, and Malaysian Anti-Corruption Commission to combat the problem, although the main problem is the vastness of the waters to be monitored and the limited assets available.

The Royal Malaysian Police play a key role in the ESSCOM area and are again the first point of contact for terrorist incidents. There has not been a major incident in Malaysia since the Sulu invasion in 2013, although the RMP has been busy fighting cross-border kidnappings in Eastern Sabah. However, due to increasing political tensions, the RMP has been active in maintaining public order and impartiality while dealing with supporters of both political factions. Online incitement and public demonstrations have been the main challenges for the RMP, which has the unfortunate problem of getting caught in the middle of every incident, with each side accusing the RMP of either unfairness or leniency, depending on their political orientation. Fortunately, most of the incidents to which the RMP has responded have not led to any escalation or breakdown of public order, but it remains a significant challenge for the RMP to deal with such incidents when the individuals involved and their supporters appear to believe that they are entitled to their actions because of their political beliefs, which override any legal authority of the RMP. Unfortunately, the polarised political situation is likely to continue until perhaps another general election decides, once and for all, which political group the public supports. Overall, Malaysia's defence and security situation is likely to continue as the government, whatever political faction is at the helm, will focus much of its efforts on confronting the political opposition while convincing the public that it is the right faction to govern the country. ■

CBRN Threats: Protecting the Population

Dan Kaszeta

Until the current COVID-19 pandemic, protection from CBRN threats was most often viewed in the defence industry and the military as a force protection issue.

However, CBRN materials are as much or even more of a threat to civilian populations, whether through accidents, terrorism, or acts of warfare. During the Cold War, large “civil defence” efforts focussed on protecting populations from the hazards of nuclear war, and various emergency preparedness efforts and “civil protection” organisations prepared to respond to natural hazards. But response to CBRN terrorism against the civilian population in the post-Cold War era evolved slowly. Despite periodic boosts in interest due to the 1995 Tokyo Sarin attacks and the 2001 Anthrax terrorism in the US, for example, it has continued to lag behind military CBRN defence in emphasis and resources. While the COVID-19 pandemic may be neither warfare nor terrorism, current difficulties in response are partially due to not planning for biological catastrophes.

Individual aspects of population protection get some attention in the CBRN industry, but it is not often examined from a holistic perspective, as both the threats and the various countermeasures are diverse. There are numerous individual features of population protection that are noteworthy. Part of the reason this is a difficult area on which to comment is that the actual threats are very different from each other. CBRN is not one thing. Chemical threats can be serious but will be localised in nature. Biological threats could, in theory, range from assassinations of single individuals all the way through pandemics that could kill millions. Radiological threats, such as “dirty bombs”, are more likely threats to be threats to physical infrastructure through contamination than mass-killers, but can pose interesting public health hazards. Nuclear weapons can destroy entire cities. This portfolio of threats cannot be addressed by any one category of countermeasures.

Author

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Photos: US Air Force



A HAZMAT technician examines a drum during a HAZMAT Spill Response exercise in Goldsboro, N.C., in December 2019. The exercise tested the Seymour Johnson Air Force Base Emergency Management team's response procedures.

Detection and Countermeasures

The United States and a few other countries use detection technology and sensors to conduct surveillance for CBRN hazards. Various programmes have been put into place to conduct detection and identification of various categories of threats against the public. Obviously, this is a sensitive area, and there could easily be hundreds of such programmes and operations around the world operating on a clandestine basis. In the chemical arena, it is not a secret that several major cities have installed monitoring systems to detect chemical warfare agents in underground public transport systems. Ever since the 1995 Tokyo Sarin incidents, it has been known that the confined spaces provided in public subway systems are vulnerable to chemical attack. For example, the Prague Metro has had a chemical monitoring system for some years now. It has been widely published that the New York City and Washington DC subway systems have monitoring systems for

chemical agents. Detection systems for chemical warfare agents and toxic industrial chemicals in civil environments have been plagued by false positives and maintenance issues, but industry has worked hard to fix the problems.

Radiological and biological monitoring are both quite different from chemical monitoring. However, there have been efforts in a number of major cities and at temporary major public events to monitor for radiological and/or biological threats. There have been widespread efforts for two decades to provide small radiation detection devices that are cheap and easy to use to police departments and customs inspectors. Such devices are now widespread in some countries and, due to their dispersed nature, provide potential wide-area monitoring for major radiological threats. Wide area radiological monitoring, much of it by private persons who made the data public, became quite an interesting phenomenon in Japan after the Fukushima nuclear incident. With internet service and data networks being ubiquitous and simple

radiation detection devices being cheap, there is much scope for crowd-sourced radiation data in the future. Digital cameras on mobile phones can actually act as reasonably accurate monitors to measure gamma radiation, given the right software. Such a network could be quite quickly launched for any future incident, and this is an area to watch for future developments. The difficulties inherent in biological detection mean that such a dispersed approach cannot work effectively. However, ever since the Anthrax terrorism in the USA in 2001, there has been a US government effort to provide wide-area surveillance against airborne biological threats. This programme, which became known as "BioWatch" has evolved significantly. It collects air samples which are processed in a network of labs. It can take up to 36 hours for results to be available, and an expensive effort to reduce this timeline to 6 hours was curtailed in 2014. BioWatch is not meant to prevent casualties, but is meant to provide a sufficient timeline for treatment during the latency period of pathogens, thus reducing overall casualty figures. BioWatch did have two known false alerts for the pathogen Tularemia. Similar



US Air Force personnel decontaminate a "victim" during a CBRN exercise based on the US National Incident Management System and National Response Plan.

lar programmes may be in existence elsewhere operating on a more covert basis. Another tactic for detecting widespread biological threats, whether from natural pandemics or deliberate attack, is to conduct medical surveillance. Such programmes and projects, sometimes called "health surveillance" or "biosurveillance", seek to use information from hospitals and clinics to detect sudden spikes in signs and symptoms relevant to particular biological

warfare agents. The overall concept is that the first actual signs of a major incident may be a sudden onslaught of sick people seeking medical help. In practise, managing the flow of data, reporting speed, privacy concerns, and getting cooperation from private and public health providers have often made such efforts difficult to execute. China's own biosurveillance efforts triggered the alarm for the COVIDS-19 pandemic.



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Medical Countermeasures

Another important aspect of population protection is medical treatment. There are numerous research efforts seeking improved medical therapies to help victims of CBRN attacks. The majority of such “medical countermeasures” efforts are geared towards military medical operations, but medicines

be given to the patients that need them. A number of countries stockpile medical items that they think might be useful for population protection against CBRN threats. The oldest CBRN stockpile programmes are likely to be efforts to store large quantities of Potassium Iodide tablets. These are useful in the event of nuclear power plant disasters, as nuclear reactors can release radioactive



A US officer conducts entry authorisation procedures during a disease containment exercise exercise at Cannon Air Force Base, N.M., in April 2019. The exercise aids in the training of health agencies to properly prepare for and respond to potential public health emergencies.

that help sick soldiers and sailors can help sick civilians. Examples in this area include improved nerve agent treatments using neuroprotectants and improved vaccines against biological warfare agents. One leader in this field is the American biotech firm Emergent, which has fielded improved Anthrax and Smallpox vaccines. There is a perennial challenge facing such efforts: it is far easier to get licensing and regulatory approvals for medicines for military personnel than for the far more diverse (and more protected by regulations) general public. The regulatory hurdles vary greatly, and it can take a long time for a novel therapy developed as investigational drug to gain approval for public use. Both the US and EU have looked into various ways to expedite such approval in emergency situations. The fact that diagnostics, therapies, and vaccines are already being talked about, only months into the COVID-19 crisis, show that some progress is being made.

Stockpiles

Many medical countermeasures for CBRN injuries already exist and are not awaiting regulatory approval. However, rare medicines are no good if they are not available to

isotopes of Iodine. Nutritional supplements that flood the human body with healthy Iodine prevent uptake of harmful radioactive Iodine, but these are only useful in the very limited range of scenarios involving nuclear power plants. In the UK, the NHS stockpiles 65mg Potassium Iodide tablets: stockpiles are known to exist in the USA and a number of European countries.

It is known that the USA and UK have stockpiled various treatments for chemical and biological incidents, and it is highly likely that a number of other countries have done the same. The American and British stockpiles contain things like Atropine and Oximes to treat nerve agent exposure, and broad-spectrum antibiotics to counter Anthrax and Plague bacteria. The American programme is vast and has caches of medicines stored around the USA: nor is it very secretive, having been presented in detail at public conferences. The UK programme, while not particularly publicised, can be found in a few minutes of searching online, and in 2015 contained antibiotics as well as “pods” of nerve agent antidotes. It is now clear that stockpile efforts should have been including personal protective equipment, which is now in critically short supply.

Resilience-Building Measures

Rather a lot of the resilience-building measures for population protection around the world are far more prosaic than new drugs and sophisticated surveillance technologies. Gradually, emergency services such as police and fire services have started to take the CBRN threat seriously. Twenty years ago, CBRN scenarios rarely featured in emergency preparedness training efforts, but they are now more common. There has been much building of capacity and capability in the emergency services around the world. As with the rest of the CBRN field, the USA and Western Europe have often led the way. However, there have been some interesting pockets of good practice elsewhere in the world as well. Turkey’s emergency management agency, AFAD, has embraced CBRN training. Singapore’s Civil Defence Force has long been concerned about CBRN threats to the civilian populace. Croatia suffered deliberate wartime damage to its chemical industry in the conflicts following the breakup of Yugoslavia and has taken the subject of CBRN protection for the population seriously in recent years.

It is now recognised that CBRN incidents will require response from across the emergency services disciplines. Police, fire services, public health, emergency medical services, and others will have to work together in the event of CBRN incidents. Historically, many emergency services around the world viewed each other competitors, not necessarily as allies. Natural disasters, large fires, civil disorder, and conventional terrorist incidents have all led to the development of incident command systems to deal with complex issues. Increasingly, such plans and procedures routinely include CBRN incidents. There are numerous such schemes around the world, many of them based on the original American “Incident Command System” which has its origins in California. While sometimes considered dull, such systems and frameworks are considered a stark necessity for dealing with CBRN incidents. COVID-19 will doubtless test much of this. Accidents, or deliberate sabotage, involving industrial hazardous materials (HAZMAT) are, by any rational analysis, one of the more likely CBRN threats. Indeed, this author has historically struggled to get some consulting clients to understand that HAZMAT threats and CBRN incidents are very much overlapping concepts. The last three decades have seen tremendous improvements in the HAZMAT area. Improvements in protective clothing, detection and identification of hazards, decontamination, and training have made it easier for emergency responders to deal with HAZMAT incidents. These

improvements on the incident response side are matched by regulatory and safety improvements on the “supply side” of the equation. Around the world, hazardous chemicals, biological pathogens, and radioactive isotopes are better regulated and better secured than they have ever been. Obviously, there is still potential for theft, diversion, and accident. But there is an overall framework dedicated to ensuring that hazardous substances are less available for terrorism and are less likely to be involved in industrial and transportation accidents. This should certainly count as CBRN protection of the population by any objective standard. Law enforcement directly shoulders protection of the population. Decades ago, the ability to investigate crimes involving CBRN materials was largely non-existent. Well within this author's own career, there was a point when the entire USA only had a handful of law enforcement agents who could wear the necessary protective equipment and collective evidence after a CBRN terrorism incident. The Tokyo Sarin incident in 1995 was a clarion call that saw a decade of great effort to improve the abilities of law enforcement agencies in a number of countries. While these efforts did not proceed to a uniform scale or at an equal pace, there is much capability now where there previously was little or none. Likewise, there have been vast improvements in laboratory capability to analyse evidence from CBRN incidents. There is still vast scope for improvement in this area. For example, the ability of regular criminology laboratories to handle forensic evidence that is physically contaminated with CBRN materials (e.g. a mobile phone with nerve agent on it) is rather limited even in the best scenarios. Likewise, the ability for dedicated CBRN laboratories to extract useful conventional information out of contaminated goods is questionable. These shortfalls must be addressed if CBRN crimes are to be adequately investigated.

Private Security

An area where much improvement is still needed is in private security. Much of the world's urban population lives and/or works in environments owned by the private sector. In major cities around the world, there are often far more private security guards on duty than there are public sector emergency responders. Security staff have a huge role to play in both prevention and response in CBRN incidents, simply due to the likelihood that they will be the first ones around the scene when something happens. However, private sector security providers usually ignore CBRN scenarios or, at best, consider them the government's



US Air Force medical personnel from Bioenvironmental Group inspect an airman as part of a simulated decontamination line during a radio-logical aircraft recovery training exercise at Little Rock Air Force Base, Arkansas, in January 2020.

problem and focus on conventional scenarios. Change in this attitude is glacial, often because of the commercially competitive nature of the security market. There are signs that things are gradually changing: security surveys and new public venue constructions are starting to consider CBRN threats, at least in small ways.

Insurance Policies

Discussions of population protection often only consider risks to life and health. Loss of residences and livelihoods through damage to property through contamination are mostly not considered part of CBRN defence. But if part of the population is rendered homeless, jobless, or impoverished by a damaging incident, then “population protection” has failed them. Insurance is, in theory, a mitigation strategy. Unfortunately, the insurance industry is struggling to keep up with the CBRN threat. Insurance policies are an important part of resilience but CBRN are rarely included in insurance cover. When they are, such policies are usually very expensive or limited in what the policy actually covers. Individual residents rarely have such cover. The insurance industry is only at the early stages of seriously considering CBRN threats. Insurance provides some scope for leveraging action from others. Insurers could, for example, do much to push private property owners to undertake prevention and mitigation measures as a condition to lower insurance premiums. It should be remembered that fire safety, a form of population protection often taken for granted, was prodded along by the insurance industry. Terrorism insurance is still new, but this is an area to monitor.

Not all improvements have permeated equally throughout the world. North America, Europe, and a few bits of the Asia-Pacific region have made more progress in CBRN civil protection than other parts of the world.

Population protection and resilience efforts are not evenly distributed around the globe. There are numerous efforts to redress this situation and help other parts of the world achieve a higher level of readiness.

Of particular interest to a European publication such as this one, there is an ongoing effort called the European Union CBRN Centres of Excellence (CofE), which is funded both by the EU and the United Nations. This effort was established in 2010 and operates with approximately 60 partner countries around the world. As of 2019, at the NATO CBRN CofE, 53 projects had been completed, 22 were ongoing, and 5 were being prepared. These span a wide range of subjects and levels of expertise. For example, Project 53 helped rehabilitate and re-equip a public health training institute in Afghanistan, and Project 58 has helped address CBRN forensic issues in various countries in the Balkans and Caucasus. Other organisations help as well. INTERPOL has developed a CBRN unit which has run projects and training efforts to help the law enforcement agencies of its member states deal with CBRN-related crimes. The CHARS project, for example, in which this author has been involved, seeks to develop the ability of countries to collect and process forensic evidence after chemical incidents. Likewise, the Organisation for Prohibition of Chemical Weapons has initiatives to help its member states.

CBRN population protection is by no means a single coherent subject or discipline. At its worst, it is a disconnected mess. At its best, it is a “system of systems” that has not really coalesced in the same way as other aspects of CBRN defence. There are interesting activities, but there is also ample scope for much more effort. The current COVID-19 crisis will be a lesson to us all: it is clear that those gestures undertaken in recent years are not sufficient for the current threat.

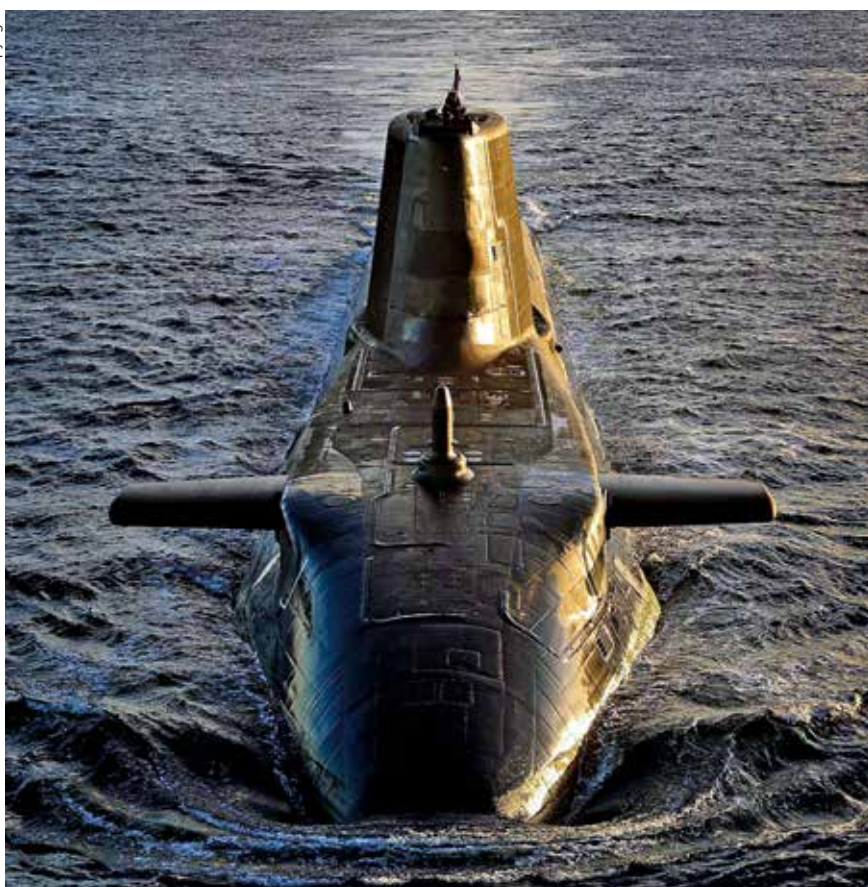
European Submarine Requirements, Resources and Programmes

Bob Nugent

Europe can be rightly considered a 'home' for submarine forces. The history of submarine design, construction and operations is deeply rooted in the European naval experience of the 20th century.

While the region's investments in submarine forces have waned since the end of the Cold War, this article highlights that the submarine will continue to remain a key component of many navies in Europe. Drawing on AMI's market research and proprietary data on naval forces, the article examines the global context of European submarine programmes, the resource commitments and trends in regional submarine forces, and provides detail on the several submarine programmes now ongoing in Europe.

Photo: Crown Copyright



The UK's HMS AMBUSH

Submarine Forces: Global Context:

Looking at the size of today's global submarine fleet, the first impression is that a tremendous amount of capability and resources are concentrated in a relatively few platforms. How few? Looking at the table below, the world's current operational submarines make up just under 4% of all ships and craft in service. With almost 100 of the world's nearly 500 active submarines in service in European navies, the region is marked by the same pattern—submarines amount to about 3.5% of all ships and craft in service in NATO navies in Europe.

While the numbers of small craft counted in the 'All types' totals below make the

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Existing Naval Market Ships Currently in Navy or Coast Guard service	Submarine	All Types	Share
Asia & Australia	175	4534	3.86%
Caribbean & Latin America	25	1309	1.91%
Middle East & North Africa	48	1488	3.23%
NATO	84	2395	3.51%
Non-NATO Europe	5	358	1.40%
Russia	66	923	7.15%
Sub Saharan Africa	3	398	0.75%
USA	70	865	8.09%
Totals	476	12270	3.88%

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submarine percentage artificially small, a similar comparison of tonnage of ships in active service supports a similar conclusion: submarines make up only a small portion of naval orders of battle in Europe and around the world.

Yet, despite their small numbers, submarines continue to represent the most expensive platform navies buy on a 'ton-for-ton' basis. A look at the forecasted numbers and acquisition costs of new submarines over the next two decades demonstrates this fact. AMI's forecast of new submarine acquisitions indicates that 34% of all spending on new construction naval platforms (US\$343Bn of a forecasted US\$1Tr in new naval ships) will go toward submarines. In Europe, this number is almost US\$60Bn in new submarine buys over the next two decades.

This US\$343Bn is going to be spent on only 10% of all new naval ship types to be acquired by 2040. Regional totals range from 30% (Russia) to 0% (Sub-Saharan Africa). Here Europe – and especially NATO member countries – show the same pattern. An average of 10% of all new European naval platforms that will be purchased in the region by 2040 will be submarines.

The numbers of subs likely to leave service over the next two decades due to age is estimated to be about one-third to one half of current inventories around the world – between 150 and 250 hulls. Over the same period, 300 or more new submarines are forecasted to enter into service.

This makes the submarine segment one of the few in today's naval market that is growing—new hulls will replace retiring hulls at greater than one for one. That pattern is also observed in Europe, where the region's 89 submarines now in service is expected to come down by a third—perhaps to 60 by 2040. At the same time, a maximum of 68 new submarines are expected to enter into service, bringing the region's submarine forces up to as much as 120-130 hulls by 2040.

Submarine Requirements and Resources

France and the UK are the only two European countries that operate nuclear powered submarines, both multipurpose (SSN) and those equipped with Ballistic Missiles (SSBN). Those two countries' submarine programmes represent the majority of planned spending on new submarines in Europe (25 and 50% of regional submarine programme funding respectively), reflecting the higher costs and larger size of nuclear-powered submarines in their forces compared to the smaller conventionally

Photo: Navantia



The S80 submarine as it was commissioned by Spain

Forecasted New Builds Estimated Ships to be Procured by Navy or Coast Guard service by 2038	New Sub- marine Hulls	Totals	Share
Asia & Australia	112	1089	10.28%
Caribbean & Latin America	15	248	6.05%
Middle East & North Africa	21	306	6.86%
NATO	63	632	9.97%
Non-NATO Europe	5	58	8.62%
Russia	55	182	30.22%
Sub Saharan Africa	0	46	0.00%
USA	44	503	8.75%
Totals	315	3064	10.28%

Country	Estimated New Submarine Acquisition Cost (US\$ Millions) (2020-2040)	Sub New Acquisition Cost as Percentage of Europe Region	Sub Acquisition Cost as % of Country's Total New Naval Platform Cost (2020-40)
France	14400	24.50%	65.13%
Germany	1000	1.70%	7.45%
Italy	1900	3.23%	13.94%
Netherlands	2030	3.45%	22.78%
Norway	4088	6.95%	81.62%
Poland	700	1.19%	17.53%
Romania	1200	2.04%	35.29%
Spain	1360	2.31%	20.45%
Sweden	2500	4.25%	52.71%
UK	29600	50.36%	59.24%
Region Total	58778		
US	150060		35.44%
Russia	37800		63.63%
China	3700		11.54%

Submarine Budget Share



Photo: via author

A type 212 submarine in docks at thyssenkrupp Marine Systems in Kiel, Germany

powered submarines that are being procured elsewhere in Europe.

The other leading submarine forces in Europe – Germany, Sweden, Italy – have all structured their submarine forces for regional or local requirements. Here, the 2000 tonne conventionally powered and torpedo and missile armed submarine represents the main type in service, as well as the design most typical of the next generation to be procured. The proportion of new spending on submarines to all new naval ship buys ranges widely – from over 80% in Norway and over 50% in Sweden, to a low of under 13% in Italy and less than 10% in Germany.

Submarine Programmes

France

The French Navy operates a nuclear-powered submarine force of multi-mission types and a strategic deterrence force. While French industry retains a robust capability to design and build conventionally-powered submarines for export, it has not adapted these types of submarines for domestic service.

The BARRACUDA Class Nuclear-Powered Attack Submarine (SSN): The French Navy (FN) has a requirement for a new class of modern nuclear-powered attack submarines (SSNs) capable of performing open ocean sea denial operations (anti-surface warfare (ASuW) and anti-submarine warfare (ASW), aircraft carrier and ballistic missile submarine (SSBN) escort/protection operations, intelligence collection and surveillance operations, and possibly power projection strikes with land attack cruise missiles.

The FN began planning for a follow-on submarine to replace the RUBIS AME-

THYSTE class, which were commissioned from 1983 to 1993. In October 1998, the then French Defence Minister Alain Richard announced that France would spend US\$3.65B for six SSNs as part of Project BARRACUDA. In November 2002, Naval Group (then DCNS) was awarded a US\$143M contract for the definition phase of the programme. In December 2006, Naval Group was awarded a US\$1.3B contract to build the first unit of the class. Construction began at its Cherbourg Shipyard in December 2007, with the first unit (Suffren) expected to commission into the FN in December 2017, later delayed to 2020. Hull Five was funded in 2016 but not ordered until May 2018, and Hull Six is expected to be ordered in 2020. With the first unit now expected to enter service in 2020, and units two through six will enter service between 2021-2029.

SSBN Replacement (3G SSBN): France operates a force of nuclear-powered ballistic missile submarines (SSBN) to maintain a credible and independent nuclear deterrent force. France's current LE TRIOMPHANT class of four hulls were commissioned in 1989, 1993, 1997 and 2002. The 3G SSBN is forecasted to begin construction in 2023 and will be delivered in the mid-2030s. All four new SSBN's are expected to be in service by the late 2030s.

United Kingdom

Like France, the UK Royal Navy operates only nuclear-powered submarines to meet a range of national requirements, from open ocean sea-denial to intelligence collection and surveillance, power projection strikes with TOMAHAWK Land Attack Missiles, support for special

operations forces, and protection of the country's SSBN force. The ASTUTE class of SSNs is nearing the end of production, while the programme for a new SSBN to replace the VANGUARD class is still in its early stages.

The ASTUTE Class SSN: The seventh and last hull in the class, the HMS AJAX (S125) is forecast to begin operational service in 2024. HMS ASTUTE, the lead hull in the class, entered service in 2010. A new SSN programme will not follow the ASTUTE class until around 2050.

The DREADNOUGHT SSBN: The replacement of the VANGUARD class has a subject of considerable debate within the UK, and the Ministry of Defence in particular, for more than a decade. A key issue was the number of hulls to be built: four to maintain a continuous-at-sea deterrence, (CASD), or three capable of 'near continuous' strategic presence. In 2016, the UK Parliament voted overwhelmingly in favour of a four-hull class. Main Gate Approval for the programme followed in that same year, as did the beginning of construction. The first unit, MS DREADNOUGHT, is expected to enter service in 2028.

Germany

The German Navy (GN) has a requirement for a modern hybrid (AIP/diesel-electric) submarine with high submerged endurance qualities to conduct aASW and ASuW, surveillance, and intelligence collection operations. The country's Type 212 submarine is fulfilling these requirements, with original planning for the programme dating back to 1987. The GN had planned to acquire ten Type 212 class units to replace its existing force of 12 Type 206 submarines, which were commissioned

Photo: Saab



As a result of its modular design and build, Saab's A26 can change its form to accommodate new technical advances or particular defence capabilities.

in the mid-1970s. However, the changing European security environment has led to cuts in the German defence budget, which lowered the planned procurement to six hulls. All six of those units were commissioned from 2004 to 2012. In May 2017, procurement of an additional two Type 212s was announced as part of increased defence spending resulting from a changing strategic situation in Europe. The two new hulls are expected to be ordered within the next year as part of a package deal with the Royal Norwegian Navy (RNoN - see below). All six units will be built at ThyssenKrupp Marine Systems (TKMS) - Howaldtswerke Deutsche Werft AG (HDW) in Kiel. The first unit will begin construction in 2022 and be commissioned around 2029.

Norway

The RNoN has a requirement for a modern submarine force able to conduct a variety of missions in the littoral waters of the Norwegian fjords and in the open ocean waters of the Norwegian Sea. Its force would play a key role in opposing violations of Norway's sovereignty or invasion of Norwegian territory. Conceptual studies for a replacement for Norway's force of six ULA class submarines began in 2007. The ULA class is currently receiving incremental upgrades (sonar, communications, EW modifications) in order to operate until 2020, although they could remain in service several more years until re-

placed by new construction hulls.

In June 2016, Norway short-listed for the new submarine programme to the Naval Group SCORPENE and the TKMS 212/214. In 2017, Germany's TKMS was selected as the country's strategic partner for new submarine programme, with the Type 212CD (Common Design) as the preferred design. In February 2017, Kongsberg entered into a teaming arrangement with TKMS and Atlas Elektronik to develop the combat system for the programme. Moreover, some 100 Norwegian companies are identified as participating in development and deliveries of subsystems. In October 2018, TKMS submitted a 'binding' proposal for joint procurement of Type 212 CD for both the German and Norwegian Navies. A contract is expected to be awarded in 2020, which would allow the first hull to be delivered before the end of 2026.

Sweden

The Royal Swedish Navy (RSwN) has a requirement for a modern submarine force for regional missions in the Baltic Sea, including ASuW and ASW, surveillance and intelligence collection, special operations support and mine-laying. The RSwN considers its submarine force to be its first line of defence, monitoring hostile activities and striking at distances far forward of Sweden's coastal waters. The RSwN submarine force is viewed as a deterrent to potential aggressors.

The A26, since named the BLEKINGE class, is expected to number five hulls in total to fully replace the Gotland class by the mid 2030's. The first unit (BLEKINGE) is forecasted to enter into service by 2024, and the second (SKANE) in 2025. The three additional units, to replace the three GOTLAND class, would need to be funded 2028 (as indicated in the Defence Bill 2021 - 2025), with deliveries anticipated the mid-2030s. Due to the gap in procurement between the first two hulls and the final three, the RSwN is expected to go with a modified variant for hulls three to five, which includes technological and possibly design upgrade.

The Netherlands

The Royal Netherlands Navy (RNIN) has a requirement for a modern force of submarines to protect its sea lines of communications (SLOCs) and maritime sovereignty. The April 2011 Dutch Government's Defence Review affirmed the continuing requirement for the four Walrus class submarines in service, with modernisation to extend their service lives beyond 2025. Further official documents stated that the WALRUS class would be replaced by a new construction class of submarines beginning in the mid 2020's. The Government and Navy are currently evaluating possible suppliers of this new submarine, including:

- Damen/Saab with the Swedish A26 design.
- Naval Group/Royal IHC with the Shortfin Barracuda design;
- ThyssenKrupp Marine Systems with the Type 212CD design (selected for Norway and German programs).
- Navantia with its S80 Plus submarine design;

A downselect to a single supplier is expected in 2020-21. A 2022 construction contract would allow for the first hull to commission in 2027, and all four to be in service by 2030. The four WALRUS class are expected to remain in service until they are replaced.

Poland

A new class of submarines remains the highest stated priority of the Polish Navy (PN) in order to protect Poland's SLOCs, and strategic waters of the Baltic Sea. Depending on armament, the new submarine could also serve as a strategic deterrent to Poland's most likely threats.

The status of the submarine procurement, however, continues to be unclear, as Poland has yet to select a preferred design, and schedule delays continue to push the pro-

gramme 'to the right'. Information from October 2019 indicates the PN is considering the lease of two submarines, to maintain operational and logistics capability until the new construction programme is approved. Based on the latest picture, AMI forecasts that new submarine construction for Poland will not begin until at least 2030, with two hulls in service by 2036.

Italy

Type U212A: The Italian Navy (IN) has a requirement for a modern hybrid (AIP/diesel-electric) submarine with high submerged endurance for distant and deep-water ASW and ASuW, Special Forces support, and intelligence collection operations. In September 1995, Italy decided to acquire the German-designed Type 212A class submarine in lieu of an indigenously developed design.

Italy's submarine procurement is taking place in stages (batches). Batch I (2 hulls) was completed in February 2008. Batch II (two hulls) was ordered in 2008 and finished delivery by 2017. In June 2017, four additional submarines were announced to be Batch III. The first two units of Batch III were financed in 2018, and the remaining

two are expected to be finalized by 2020. The four new Batch III hulls are expected to enter service between 2026 and 2030. All are being built by Italy's Fincantieri.

Spain

Spain requires diesel-electric submarines to conduct ASW and ASuW operations in its maritime approaches (the Eastern Atlantic, the Strait of Gibraltar, and the Western Mediterranean). In 1988, Navantia of Spain and Naval Group of France formed a consortium and began the design work to replace four French Agosta design submarines then in Spanish naval service. A modified version of the French Naval Group SCORPENE submarine designed for export was the approved and designated S80A. Construction on the first of four S80A hulls began at Navantia's shipyard in Cartagena in March 2005, with Unit Two starting in 2008 and Unit Three in 2009.

However, budget shortfalls and technical issues related to the design (stability and weight) arose in the 2012-2013 period, resulting in a delay to the programme. Under the latest schedule, Unit One will join the fleet in 2022, the second in 2024, the

third in 2025 and the fourth in 2027. With the expected cancellation of the second batch of four S 80s and extended delays in the first batch, the three GALERNA (AGO-STA) class submarines now in service (that were commissioned in the mid-1980s) are expected to be modernised to remain in service.

Romania

The Romanian Navy (RN) has stated a requirement for a submarine force of three hulls in its 2018 White Paper. The submarine force would protect the country's territorial waters as well as operated with NATO as needed. The RN's single Russian-built KILO class submarine is no longer in service, so the Navy currently lacks such a capability. Should funding emerge (which is questionable), a construction contract awarded by 2030 would see three submarines in service by 2037. However, similar to the situation in Poland, amidst budget shortfalls and expected programme delays, Romania could seek to lease of existing submarines from another country to maintain basic submarine operational and logistics capabilities. ■

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Future Tactical UAS

Alex Horobets

Unmanned systems are rapidly transforming warfare around the globe.

Today, their development and implementation for operations in land, air, and marine domains is a priority for leading global companies.

Unmanned systems have long become an integral part of military exhibitions, serving as an indicator as to whether a specific defence firm has any high-tech developments.

The military use both high-tech stealth drones and commercial UAVs, which are much cheaper than specialised models. Being unable to acquire military drones, non-state actors like ISIS and other groups opt for modifying cheap Chinese-made drones to carry explosives and conduct one-off attacks on the enemy. In 2019, there were numerous reports of such drones being used by both warring sides in Libya to attack military bases and other facilities, having largely replaced manned aircraft. Unmanned aerial vehicles were also actively used in armed conflicts in Iraq and Syria.

First, it should be understood that the concepts of an unmanned aerial vehicle, a drone, and an unmanned aerial system, both in literature and the media, are associated with an aircraft without a crew, operating in an automated mode or being controlled remotely by an operator. Whatever the name, it all boils down to the same concept.

One way or another, individual features of drones have long been used. During World War Two, radio-controlled B-24s were used for bombing. During the Vietnam War, remote-controlled aircraft were used for aerial photography. Israel used drones in the Middle East for reconnaissance and as false targets during the 'War of Attrition' (from 1967 to 1970), Yom Kippur War, and fighting in Beqaa Valley. However, a full-fledged drone boom began only with the advent of high-quality photo and video equipment, as well as the ability to transmit images and video in real time. Satellites could partially satisfy such needs, but there are relatively few of them, and they are not always positioned above the required locations.

Background

The active use of drones began in 2000, and is primarily associated with the US. The experience of the first and second Iraqi

Photo: US Air Force



An RQ-4 GLOBAL HAWK unmanned aircraft, like the one shown, is currently flying non-military mapping missions over America as well as the Caribbean at the request of partner nations in the region.

campaigns and the Afghanistan mission led to the increased use of attack and reconnaissance drones in areas where it was too difficult and dangerous for the US military to conduct raids or where there was a great risk of manned aircraft being downed. Another advantage of unmanned aerial vehicles over manned fighter jets was that they are much cheaper while having comparable capabilities, being much smaller in size and able to transmit data almost in real time.

Based on analysis of data received from drones, the military and intelligence services were able to continuously monitor targets, comparing and confirming the data with intercepted phone calls and correspondence. Moreover, the operator could immediately engage the target without the need to deploy troops to some remote area.

The rise of drones saw discussions on whether it was morally acceptable to use them. While human rights organisations claim that the use of strike drones leads to a large number of innocent victims among the civilian population, others believe that surgical strikes by drones re-

sult in far fewer casualties than any other use of force.

Either way, having first occupied the niche of light recon vehicles, in a short period of time, drones have become full-fledged strike units deployed, for example, Afghanistan, Pakistan, Yemen, Syria, Iraq, and many other other places.

The term 'unmanned aerial system' (UAS) was adopted in 2005 by the US Department of Defence and the US Federal Aviation Administration in line with the Unmanned Aircraft System Roadmap 2005–2030. This term is often used by NATO Allies to emphasise the importance of other elements of an unmanned system, such as ground control stations and data transmission channels.

Applications

At the moment, the range of drone use in the armies is wide. Although the most common are reconnaissance and strike drone, they are also employed in electronic warfare as radio signal repeaters. They are used to spot artillery fire and as aerial targets. Kami-

kaze drones stand out as a separate group. For example, the US Navy is testing the REMEDY miniature unmanned aerial vehicles for electronic reconnaissance and electronic suppression developed by Northrop Grumman and VX Aerospace. The REMEDY drones will be deployed by the electronic warfare version of the EA-18G GROWLER. It is assumed that GROWLER aircraft will launch electronic warfare drones long before they enter the zone covered by enemy radars, which will increase the scale of electronic reconnaissance in one take-off of the aircraft, as well as provide suppression of enemy electronic systems over a wider area. Given the different directions of the use of drones and the corresponding characteristics, classification by mass, tactical and technical characteristics is also applied to them. Ultra-light, light, medium and heavy aircraft stand out. In the first category, the weight of the device does not exceed 10 kg, with a fly time of no more than one hour. The lighter REMEDY UAS will have a weight of about 50 kg, with two to three hours of operation and a maximum altitude of three to five km. Medium drones weighing up to a ton can reach a 10 km altitude and can operate without landing for up to 10 hours. Heavy drones weighing more than a tonne are capable of climbing up to 20 km and fly non-stop for more than one day, including performing intercontinental flights.

Current Developments

Work on unmanned aerial vehicles is currently underway in many countries around the world. Among major UAV manufacturers, experts say that there are US-based Northrop Grumman, General Atomics Aeronautical Systems, Boeing, AAI and IAI. Northrop Grumman's strategic RQ-4 GLOBAL HAWK UAV is by far the largest unmanned aerial vehicle. It has a take-off weight of 14.5 tonnes and carries a payload of 1.3 tonnes. It can stay in flight for up to 36 hours. These US Air Force strategic drones are most frequently used to do long hours of reconnaissance work in the Baltic region, as well as near the occupied Crimean peninsula. The RQ-4 GLOBAL HAWK is capable of surveying large areas, conducting high-resolution reconnaissance of point targets, and transmitting real-time reconnaissance data to the military command. The General Atomics Aeronautical Systems' MQ-1 PREDATOR is designed for reconnaissance and high-precision ground strikes. A radar station, several video cameras, and an infrared system are installed on the vehicle.



Photo: US Army

US soldiers attend to an RQ-7 SHADOW UAS at Forward Operating Base Fenty on Jalalabad Airfield, Afghanistan.

The complex consists of four drones, a control station and a satellite communications terminal.

The ScanEagle UAV was commissioned by Insitu and ordered by Boeing Corporation. At the heart of the ScanEagle is the Insitu-designed SEASCAN aircraft, a ship-based reconnaissance platform. The UAV is launched with the help of a pneumatic catapult, capable of flying along the route laid down in the programme at a maximum altitude of about 500 metres.

AAI Corporation's RQ-7 SHADOW UAV is designed for reconnaissance at the brigade level. This UAV is equipped with a conventional or infrared video camera, radar, target illumination equipment, laser range finder and multispectral camera. It can also carry a controlled 5.4 kg bomb.

HERON, developed by IAI, is a medium-high UAV designed for reconnaissance and surveillance, as well as other tasks during long missions for up to 45 hours at altitudes of up to 10,700 m. HERON is able to carry optoelectronic and infrared systems, electronic warfare stations, small-sized radars and more.

In recent years, Polish, Turkish and Ukrainian defence companies have developed different classes of drones - these are countries that are not among the world leaders in this field. Some of these manufacturers are already developing the second or third generation of unmanned technology and have already received international orders for their products.

For example, UkrSpecSystems has achieved great success in Ukraine with its unmanned aerial reconnaissance system PD-1, which has already been showcased at international arms exhibitions. The company's history is interesting as it began in 2014, when the

first products were created with voluntary funding to help the Ukrainian Army.

For a short time, the company donated the assembled drones to the Army for free and immediately received first contracts from the Ukrainian Armed Forces. The drone is popular because it is being constantly enhanced following feedback from the Army, while its strike version has now also been developed. As a result, the Ukrainian company's drones have begun to be sold to Poland, Spain, Australia and UAE.

Moreover, a joint venture between the Turkish company Baykar Makhina and the Ukrainian state-owned company Ukrspetsexport is developing the heavy AKINCI drone, which will be able to lift up to a tonne of weapons and stay up in the sky for nearly a day.

Indicative of a new generation of unmanned systems is the development of Air Force Research Laboratory prototypes stemming from the SKYBORG unmanned combat aerial vehicle. It will be significantly cheaper than other platforms and is expected to be operational in 2023. At the request of the US Air Force, SKYBORG should be able to take off and land on its own, fly in bad weather and avoid other planes and obstacles on the ground. A similar prototype, the Kratos XQ-58A VALKYRIE experimental drone, has already completed its maiden flight on 5 March 2019, as part of the US programme 'Air Force Low Cost Attributable Strike Demonstrator'.

In the future, such modular devices will serve as a springboard for more complex projects that serve to introduce artificial intelligence in drones - from fairly simple aircraft control algorithms to the implementation of complex AI levels to perform certain mission tasks. Modularity will also al-

Photo: Bayraktar



The co-produced Turkish-Ukrainian AKINCI drone

Photo: US Air Force



Engineers prepare an unmanned jet-powered aircraft for a flight test at Edwards Air Force Base, California, in July 2019. The flight tested a software suite called Testing Autonomy in a Complex Environment (TACE), which is also intended for the REMEDY UAS.

low the use of various sensors and weapons, depending on the nature of the mission. It is assumed that projects such as SKYBORG and VALKYRIE will not compete, but rather complement existing unmanned systems, opening up opportunities for a more diverse unmanned fleets. This happens at a time when the air force is undergoing a reduction and facing budget constraints. It is likely that the balance between manned aircraft and drones, if it changes in the coming decades, will not be in the direction of reducing the number of aircraft, but so that each aircraft has several unmanned aids. However, to date, no great advancement has been noted in the US Army in the design and production of demonstration technologies for next-generation unmanned systems.

Drone Swarms

Another promising is for the future are swarms of drones. These are many unmanned platforms that are used to achieve a common goal and autonomously change

their behaviour based on communication among themselves. This adaptation of behaviour is dependent on the real-time situation. A swarm is different from a group of individual drones because the elements of the swarm are able to communicate with each other. Millions of dollars have been invested in this technology by advanced countries around the world. For example, entire swarms of drones can be used to suppress enemy air defences. With a very large number of drones, the respective air defence systems will not be able to respond.

It is assumed that in the future a swarm of drones based on artificial intelligence will independently assess the situation on the battlefield, share tasks, act with minimal human involvement and react much faster than humans. It is highly probable that swarms of drones will initially perform relatively simple tasks, such as deceiving radar systems and engaging enemy air defence systems. In the long-term, drone swarming technology might impact on all military sectors,

from transporting a warhead to a target to improving the protection of its own facilities. However, there are discussions about the introduction of a drone swarm - whether its further development will be cost-effective compared to other unmanned projects. Moreover, the development of a drone swarms implies finding ways to effectively protecting data transfer in such swarms, since there is a high probability of hacking where the enemy is able to intercept signals.

Outlook

The development of unmanned aerial systems in 2000 was a response to the altering nature of military operations. Capacities are growing to effectively conduct military operations where direct participation of combat groups on the ground is too dangerous, while there is also a need to carry out important and urgent tasks. Today, drone development has been in the making for years with both cons and pros, which are likely to remain for some time to come. They are undoubtedly a cheap way to project power – much cheaper than manned fighter jets and reconnaissance aircraft, which has led to a boom in the development of drones in countries such as Ukraine, Turkey and Poland.

First of all, the existing reconnaissance and strike drones have reached a high level of maturity and, in general, are able to tackle challenges facing the military. They hold tremendous potential for modernisation in terms of reducing size and weight, increasing battery life, improving the accuracy and quality of transmitted data, reducing the risk of strike errors and using new types of weapons.

The future development of drones aims to improve their autonomy through the introduction of artificial intelligence and the development of neural networks and, consequently, through the use of swarms of drones.

In the development of unmanned air systems, the idea prevails that they should supplement, not replace, human operators. This means that pilots will still be in great demand in the foreseeable future. In parallel, both manned and unmanned systems will continue to evolve with their further integration - a single pilot manned fighter jet paired with several unmanned vehicles, or some small UAVs launched alongside a fighter jet or cargo aircraft.

Parallel to the development of unmanned aerial systems, there remains the ongoing task of developing systems to counter enemy drones and further improving the data transmission systems and communication channels used in such processes. ■

European Medium Transport Helicopters

Luca Peruzzi

To meet the growing demand for mid-size transport rotorcraft to replace the world's ageing fleets of military and homeland security platforms, Airbus Helicopters and Leonardo Helicopters are proposing military derivatives of civil platforms; NHindustries wants to keep the NH90 up-to-date with the latest software and avionics; while Sikorsky's PZL Mielec offers the S-70i.

AW-139M

Based on Leonardo's medium twin-engine AW-139 platform, sold in more than 1,100 units, and having accumulated over 2.3 million flight hours with more than 270 governmental, police, armed forces and private customers, the military version the AW-139M has seen important procurements in the last years. In September 2018, the US Air Force awarded a US\$2.4Bn contract to an industrial team headed by Boeing, and including Leonardo, to replace the fleet of UH-1Ns with 84 helicopters in the so-called MH-139A GREY WOLF customised version, including a maintenance, training and support package. Deliveries have begun in December 2019. The helicopters will protect ballistic missile bases and assist in civil support missions.

Additionally, in December 2019, the Italian Ministry of Defence (MoD) has awarded a contract to augment the Italian air force's current fleet of 13 AW-139M with an additional 17 helicopters to accomplish SAR, slow-movers chasing, homeland and civil protection missions. With a maximum take-off weight of 6,400 kg (6,800 kg as optional increased gross weight) and an overall length with rotors turning of 16.66 m (with a 13.8 m rotor diameter), the AW-139M is powered by two Pratt & Whitney Canada PT6C-67C 1,252 kW-each dual-FADEC engines providing a maximum speed of 310 km/h and a maximum endurance of 5h 13 min with auxiliary fuel, in addition to a 'best in class' power-to-weight ratio. Based on an AW-139 airframe with a NVG-compatible glass cockpit centred on four multi-function colour displays (MFCD) and a four-axis digital autopilot, the military version comes with heavy duty landing gear, self-sealing crashworthy fuel tanks and a customisable mission equipmentsuite, including nose-mounted surveillance, search and weather radar, Electro-Optical/IR with laser targeting capability turret, fifth additional display for moving map and cameras, secure communications and SATCOM, res-



Photo: US DoD

Boeing and Leonardo are delivering the first batch of 84 MH-139A GREY WOLF helicopters to the US Air Force to replace the UH-1Ns fleet.

cue hoist, bubble cabin windows or sliding doors, searchlight, cockpit and cabin ballistic protection and a defensive aid system (DAS), including radar (RVR), missile (MWS), laser (LWS) warner and countermeasure dispensing system (CMDS). Designed with inherent multi-role capability, the AW-139M features the largest passenger cabin in its class with two large sliding doors. With a crew of one or two pilots, the transport cabin can accommodate up to 15 lightly equipped troops or eight deployable troops in combat gear and two gunner stations with 7.62mm general purpose machine guns. As an alternative, the cabin can host up to four stretchers with up to five medical attendants. The military version shares the same 3.4 m³ baggage compartment of the civil model and can be equipped with a cargo hook for external payload carriage. The AW-139 can also accomplish armed escort missions due to two external weapon system carriages for 7.62/12.7/20mm gun pods and/or laser guided/unguided rockets and/or air-to-ground missile launchers managed by an open architecture mission package including helmet mounted display.

The H-160M Joint Light Helicopter

Last February, the French procurement authority commissioned an industrial team, including Airbus helicopters and Safran Helicopter Engines, to carry out the pre-development activities and related support package for the military version of the new generation of Airbus H-160 helicopters. Dubbed GUÉPARD (CHEETAH) under the Joint Light Helicopter programme, the H-160M has been selected to satisfy the French Armed Forces requirement to replace with a single type of rotorcraft the in-service five fleets of light helicopters, including the GAZELLE, ALOUETTE III, DAUPHIN, PANTHER and FENNEC types in order to reduce development and in-service costs.

In addition to pre-development activities, in particular for the avionics, sensors and adaptation of the cabin to military missions (including operations from French Navy ships) the studies will also focus on defining the optimum set-up to support the tri-service H-160M fleet.

Photo: Leonardo



The AW-139M military version shares the airframe, power plant, glass cockpit (depicted here) and avionics with the civil model sold in over 1.100 units.

The French military will accomplish with a single platform a wide range of military missions, from armed reconnaissance and fire support to special forces and medical evacuation, from airspace protection to SAR, from naval forces protection to anti-surface warfare. With a maximum take-off weight of 6,050 kg and an overall length (with rotors turning) of 15.7 m (with a 13.4 m diameter rotor and foldable blades), the H-160M is powered by two new generation Safran Helicopter Engines Arrano 1A 955 kW FADEC engines with reduced fuel consumption and maintenance needs, providing a maximum speed of 317 km/h and

a maximum range of 848 km with 20 minutes reserve. Characterised by the noise-reducing and performance-enhancing BLUE EDGE main rotor, a new canted fenestron and horizontal bi-plane stabiliser, the new H-160M will be equipped with the Thales FlytX avionics suite centred on four large area main MFCDs for displaying all flying and mission data, latest generation autopilot and a tailored mission suite with a new Thales distributed antennas tactical radar and Safran Euroflir 410 EO/IR system, DAS suite as well as digitally managed mission and maintenance data. In addition to the two-pilot crew, the large transport cabin

can accommodate up to five fully equipped with commandos or two stretchers and five troop seats, in alternative to gun door stations as well as external side-mounted gun, rockets pods and launchers for MBDA ANL/SEA VENOM anti-ship missiles.

The S-70/S-70i

With over 4,000 helicopters of all types in service today, the S-70 BLACK HAWK, known internationally as the US Army tactical transport helicopter with over 40 years of combat proven operations, is available directly from Sikorsky in the US or from the Poland-based Sikorsky subsidiary PZL Mielec under the designation S-70i. Airframe and systems are identical to the latest US Army's UH-60M model. According to Sikorsky, customers can order aircraft with mission sets and features customized to specific preferences, including troop transport and air assault, command and control, border patrol, search and rescue, cargo lift and VIP transport. The PZL Mielec subsidiary assembled and delivered the S-70i to international customers, including the Brunei MoD, Colombian Army, Chilean Air Force and, more recently, the Polish MoD. In January 2019, the Polish MoD ordered four S-70i in a customized version to conduct special forces operations, which were delivered in December 2019.

Sikorsky handed over an S-70i helicopter to the Turkish defence electronics manufacturer Aselsan in March 2017 to carry out outfitting in line to the requirements of the prototype unit for the Turkish Multi-role Helicopter Programme. The latter is seeing 109 so-called T70 helicopters to be delivered by Turkish Aerospace Industries as the Programme's prime contractor.

The UH-60M's customers include Bahrain, Jordan, Mexico, Saudi Arabia, Slovakia, Sweden, Taiwan, Thailand, Tunisia and the UAE and is being procured by Albania, Croatia, Latvia and Lithuania. With a max take-off weight of 9,979 kg (10,569 kg as max gross weight with external load) and an overall length with rotors turning of 19.76 m (with a 16.36 m rotor diameter with wide chord blades), the S-70i is powered by two General Electric T700-GE701D 1,492 kW-each dual-FADEC engines providing a maximum cruising speed of 296 km/h and being capable of 4,082 kg maximum external load. Equipped with an integrated NVG compatible glass cockpit based on four MFCDs, moving map display, four-axis autopilot, enhanced CNI, an integrated vehicle management system as well as a DAS with MWS, LWR and CMD and provisions for EO/IR turret, the S-70i features

Photo: Italian MoD



In December 2019, the Italian MoD awarded a contract for an additional 17 AW-139M to add to the 13 already in service with the Italian Air Force.

a transport cabin able to accommodate 11 troops as well as two gunner stations with 7.62mm GPMG. The UH-60M/S-70i is also available with an external four weapon station carriage system for 12.7mm, rockets and HELLFIRE missiles or soon with a new less intrusive and easy to install/remove two single-station carriage system developed by PZL Mielec, to begin testing in 2020.

AW-149

Developed since its inception as a platform to satisfy military missions' requirements, the Leonardo AW-149 helicopter is being pitched to customers who are considering replacing their fleets of ageing multi-mission helicopters. Six AW-149 rotorcraft are already in service with the Royal Thai Army. Allegedly, it has also been selected by Egypt. Designed as a multirole platform capable to exceed the latest military and civil certification requirements with attractive through-life costs and certified by the Italian Directorate of Air Armaments and Worthiness, the AW-149 combines a compact size/small footprint with a large reconfigurable multirole cabin. With a maximum take-off weight of 8,300 kg (8,600 kg as optional increased gross weight) and an overall length (with rotors turning) of 17.57 m (with a 14.60 m rotor diameter), the AW-149 is powered alternatively by two-spaced General Electric CT7-2E1 1,479 kW-each or Safran Aneto-1K 1,827 kW-each dual-FADEC engines with APU providing a maximum speed of 313 km/h. Helicopter out of ground effect performances with GE engines reaches 2,893 m (3,866 m with Safran engines) while maximum endurance (sea level) reaches 4h 55 min



Photo: Airbus Helicopters

The H-160M glass cockpit is based on the Thales FlytX avionics suite, centred on four large area main MFCs for the display of all flight and mission data.

with under floor and transversal auxiliary fuel tanks but no reserve. Contributing to its survivability, the aircraft has crash-worthy fuselage and seats, heavy duty landing gear, self-sealing fuel tanks, a 50 minutes 'run dry' capable main gear box and an advanced mission suite, including a DAS, the latter featuring ESM/RWR, MWS, LWS and CMDS. The AW-149 is equipped with a baseline fully integrated NVG-complaint glass cockpit centred on 4 MFCs, integrated flight control/Mission Management System with advanced 4-axis AFCS with autopilot and mission management computer, CNI, weather radar and electro-optical/IR turret with target designation in the nose, in addition to an open ar-

chitecture for sensor and weapon systems integration. The reconfigurable 11.2 m³ cabin has a rear internal compartment for additional materiel or auxiliary fuel tanks and can accommodate up to 19 lightly equipped or 16 fully equipped troops. While ballistic protection as well as crew-served weapons, such as 7.62mm GPMG or 7.62mm gatling (located in the forward cabin windows or cabin doors), can be provided, it nevertheless reduces the seating to 10 units with two gunner stations. Alternatively, the cabin can accommodate NATO stretchers on the flat floor with lateral seating for medical personnel and equipment or up to four stretchers in a floor mounted module. The cabin and



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Photo: Airbus Helicopters



The DGA has awarded a service contract to a team including Airbus Helicopters, Babcock and Safran for the delivery and support of four loaned H-160s to be used by French Navy for 10 years from 2022.

platform are easily reconfigurable for a range of missions, from tactical transport to cargo pallet re-supply/external lift, in the latter case with a 2,800 kg cargo hook. The AW-149 can also accomplish armed escort or close air support missions due to two external weapon system carriages for 7.62/12.7mm or 20mm gun pods, seven-tube guided/unguided rocket pods and/or anti-tank missile launchers managed by an open architecture mission package.

H-225M

Evolved from the experience accumulated by some 100 Airbus Helicopters SUPER PUMA/COUGAR operators with more than 900 helicopters and over 5.5 million flight hours, the H-225M airframe features reinforced structural main frames, upgraded main gear box, latest generation five-blade Spheriflex main rotor and Safran Makila engines,

advanced glass cockpit and avionics, in-flight refuelling, high-energy absorbing landing gear, along with self-sealing and crashworthy fuel tanks. Delivered to the French Air Force from 2005 as EC725 CARACAL for Combat SAR operations and having proven itself in combat service in Afghanistan, Lebanon, Libya and Mali, the designated H225M is currently in service with five customers, including Brazil, Mexico, Malaysia, Indonesia and Thailand, with more than 95 helicopters having accumulated over 114,000 flight hours by October 2019. In addition to current operators' follow-on orders, the H-225M is also under procurement, production or delivery to Kuwait, Singapore and Hungary. In 2016, the Kuwait MoD ordered 30 helicopters, the first of which having started flight testing in October but are yet delivered and to be operated by the Kuwait Air Force and National Guard. The H-225M is also under production for the Singapore Air Force to replace the SUPER PUMA. Hungary has ordered 16 H-225M's equipped with the HForce weapon management system. With a maximum take-off weight of 11,000 kg (11,200 kg in external load configuration) and an overall length (with rotors turning) of 19.5 m (with 16.20 m rotor diameter), the H-225M is powered by two Safran Helicopter Engines Makila 2A1 1,567 kW-each dual-channel FADEC engines providing a maximum speed of 324 km/h and a maximum endurance of over 4h 20min with standard fuel and no reserve. The H-225M has, however, in-flight refuelling capabilities proven in service with French Air Force and extending endurance to 10 hours. In addition to its battle survivability features, including a 50 minutes 'run dry' capable MGB, ballistic protection for both cockpit and transport cabin, and a DAS featuring RWR, MWS, LWR and CMDS, the H-225M features a new integrated NVG-compatible glass cockpit centred on four larger MFCD, flight control/Mission Management System with advanced four-axis AFCS with autopilot, a weather radar and EO/IR turret with target designation in the nose. In addition to the two-pilot crew, the reconfigurable cabin can accommodate up to 28 seats plus one crew-chief or up to 14 crashworthy seating on cabin walls or alternatively 11 stretchers with 4 medical attendants. Two forward positioned crew-served 7.62mm GPMG weapon stations are available, reducing the cabin's troops crashworthy seating. The H-225M can be equipped with the modular and open architecture HForce weapon management system with two

Photo: PZL Mielec



In addition to assembling the S-70i helicopters, PZL Mielec has developed a new external dual station weapon carriage system for the same platform.

external weapon system carriages for 7.62/12.7mm or 20mm gun pods, 7-tube guided/unguided rocket pods and/or anti-tank missile launchers.

NH90

With an order book of more than 560 helicopters, of which 415 have been delivered so far, the NHIndustries NH90 platform in both the tactical transport helicopter (TTH) and Naval Frigate Helicopter versions has so far logged more than 220,000 flight hours with 18 worldwide armed forces in 13 countries. In 2018, Qatar became the 14th customer with a procurement contract for 16 TTHs and 12 NFHs helicopters in customised variants, with deliveries expected to start by June 2022 and to continue through to 2025. Developed by NHIndustries – the largest European consortium (including Airbus Helicopters (31.25%), Airbus Helicopter Deutschland (31.25%), Leonardo (32%) and Fokker (5.5%)) – both NH90 versions are currently under production and delivery for Germany, Italy, France, Greece, Spain, Norway and Qatar Armed Forces. Although the NH90 platform has initially experienced serviceability and support problems, both versions have soon demonstrated their capabilities in challenging theatres of operations, including Afghanistan, Iraq, Mali, Papua New Guinea, Vanuatu and Fiji Islands, Caribbean Sea and the Gulf of Aden. Based on the common design of the two versions with a full composite airframe and composite damage-tolerant rotor blades, fly-by-wire flight controls and full glass cockpit, fully de-iced and



Photo: US DoD

Sikorsky's Poland-based PZL Mielec subsidiary has delivered five S-70i to the Colombian Army.

2x2,000 Kw GE T700/T6E1 or 2x2500 Kw RTM322-01/9-9A dual-channel FADEC engines, the TTH and the NFH-based amphibious/tactical transport versions have an easily reconfigurable cabin with two large sliding doors, capable of accommodating up to 20 crashworthy foldable troops seats. In addition to ballistic protection for both the cockpit and transport cabin, the latter can be equipped with 7.62mm or 12.7mm pintle-mounted machine guns. With a maximum gross weight of 10,600 kg and a maximum speed of 300 km/h, the NH90 has a maximum range of 900 km with a 2,500 kg payload in nominal conditions, which can be optionally extended with two external or internal fuel tanks up to 1,600 km. With a full glass-cockpit

centred on four MFCD's, a four-axis autopilot, state-of-the-art communication and navigation suite, weather radar and a piloting FLIR for high-speed tactical flight with flight/mission information represented on a Helmet Mounted Sight Display in addition to an obstacle warning system, the TTH is equipped with a self-protection suite based on RWR, MWS, LWS and CMDS. The TTH platform and mission suite forms the base of the Maritime Tactical Transportation variant equipped with a specific landing gear and automatic blade folding, under delivery to the Italian Navy in 10 helicopters by 2021. In addition to the current customers, NHIndustries and partner companies have on-going sales campaigns, with a TTH Request for Proposal submitted by a North African country in 2019, while several opportunities exist in the Middle East region for the NH90. With the signing in 2018 among NHI, NETMA and nine countries of the Through Life Support programme contract covering five years with options for contract duration, the consortium delivers ILS, technical support configuration management and continued airworthiness, making the platform more affordable. Considering the current helicopter design was first contracted in 2002 with deliveries starting in 2006, NHIndustries is continuously talking with its customers and updating the aircraft and mission software while looking to a new avionic and mission electronic suite for long-term evolution. While the development of the new software release two (SW2) is agreed, main driver integration of last standard IFF mode five, the follow-on is currently under discussion. ■



Photo: Leonardo

Leonardo's AW149 twin-engine medium helicopter is in service with an undisclosed customer.

The Foundation of all Armies

Ammo for the Guns – 105mm and 155mm

Tim Guest

155mm and 105mm tube artillery will both play continuing roles, to a greater or lesser extent, on future battlefields, making the need for the continuing manufacture, development and optimisation of their respective ammunition systems of ongoing importance, particularly in the face of changing operational demands.

The need for the ammunition can only be justified if there is a need for the weapon to fire it. Obvious, sure, but some would have you believe it will not be long before there is no longer a widespread need for 105mm artillery. However, one size does not fit all, and while 155mm self-propelled (SP) artillery is the predominant asset deployed worldwide by western armies at this time, (not to mention some 152mm guns), and these – with their longer-calibre versions – will form the critical component of mass, future Long-Range Precision Fires (LRPF) and Extended Range Cannon Artillery (ERCA), there will always be scenarios for which these heavy systems are unsuited and where only a lighter, 105mm towed howitzer can go, perhaps rapidly deployed into inaccessible regions, sometimes by air and often with specialist troops. These systems will continue to play their part in scenarios where the bigger guns are tactically impractical and unsuited. Not to mention new mobile 105s mounted on light vehicles, which will also play a part in future mobile battlefield scenarios.

Certainly, the latest 155mm SP platforms will be crucial in prosecuting support fire missions at medium ranges, but targets at shorter ranges will remain the preserve of towed or wheeled 105mm systems (even shorter ranges, the mortars). This makes procuring new ammunition and driving the modernisation of ammunition types for both 105mm and 155mm systems an ongoing imperative.

This encapsulated look at the operational *raison d'être* for the two different calibres is good enough for this author to accept that both will be around for the long haul – it is a position echoed by most, including manufacturers including EXPAL (see below), and it allows us to focus on ammunition for these two calibres, together with some relevant industry views and

Photo: BAE Systems



NAMMO RAP fired from an M109A6 in trials in the US

recent developments, particularly in the realm of 155mm Extended Range (ER).

A Spanish View of Two Calibres

Together with a complete family of conventional artillery ammunition for 105 and 155mm calibres, leading ammo maker EXPAL (under the MAXAM umbrella) has developed its own family of ER artillery ammunition based on Base Bleed (BB) technology, providing extended ranges up to 20km for the L118 Light Gun and 17Km for M101/33, L119 and LG1 howitzers, with standard *fayre* high explosive (HE), high explosive base bleed (HEBB), illuminating white light and smoke rounds. In addition, EXPAL has developed new versions, including illuminating IR, white and black light, and

RP multispectral smoke for screening in visible and infrared scenarios and the company also makes all munition components such as fuses, cartridge cases, primers and propelling charges. This leading ammo maker shared some thoughts from its manufacturer's perspective with ESD about both 105mm and 155mm artillery ammunition through its Field and Naval Artillery Product Manager, Luis Abad, including some of the company's recent product developments.

On the overall subject of 105-calibre ammunition versus 155-calibre and whether there is a trend by EXPAL customers in favour of 155mm ammunition, and less demand for 105mm rounds. He said that it is a known fact that the trend to upgrade/replace 105 systems to 155-cal systems exists, but that "the pace of this is not so clear".

In the meantime, the company still has a strong demand for 105mm rounds, which continues to grow each year for Extended Range solutions. As for the prospect of a time when 105mm rounds will no longer be produced due to the changing operational picture, he told ESD that this is something the company just does not see, "at least not in the short or medium terms", adding that "each calibre is destined for different scenarios, threats and operations". And as for what types of rounds are in highest demand Abad said that while the whole industry is facing new era concerns, such as REACH compliance, as well as increasingly restrictive STANAG evaluations, both of which he stressed EXPAL is right on top of as an artillery industry leader, of the company's offerings for 105 and 155mm rounds, such as HE, Illum, Smk, he confirmed that HE continues to be the clear winner in terms of quantities ordered.

In terms of specific product developments at EXPAL, Abad said that in relation to 105mm rounds the company now has an Extended Range ER50 SMK Red Phosphorous round, which is designed to provide enhanced smoke screen capabilities, from both its obscuration/ occultation performance properties (in both visible and infrared spectra), as well as the curtain duration of the screen. The chemical composition of this 105mm smoke round has

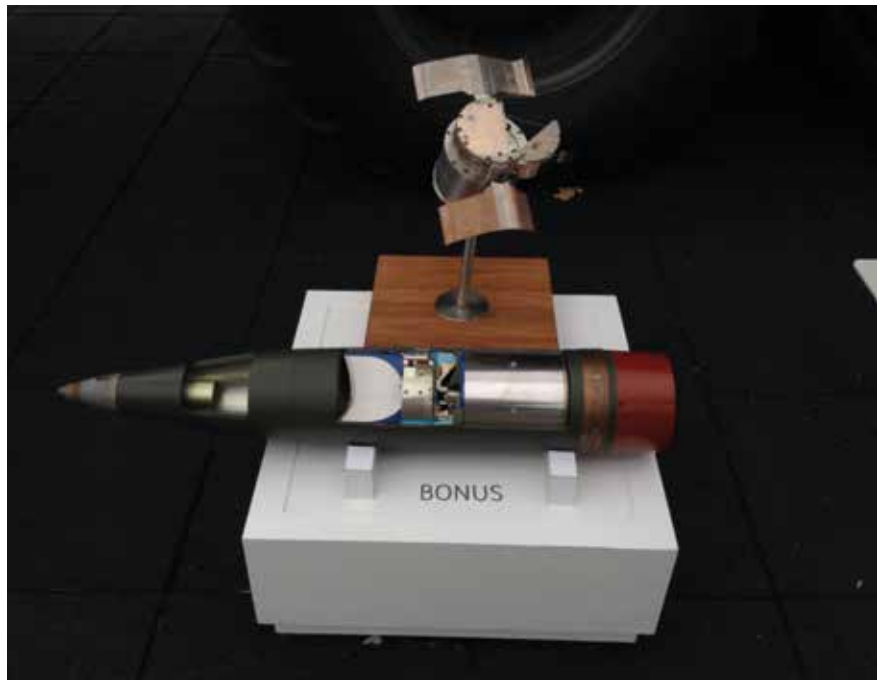


Photo: TG ESD

The US Army will be buying additional advanced BONUS munitions manufactured by BAE Systems and Nexter of France. The BONUS round contains two sensor-fused warheads with advanced target-seeking sensors. Once deployed they independently seek, track and strike targets within an area of 32,000 square metres.

been developed in cooperation with the Spanish MoD and is fully REACH compliant. [NB: REACH - Registration, Evaluation, Authorisation and Restriction of Chemicals is a EU regulation, which addresses the production and use of chemical substances and their potential

impacts on both human health and the environment.] EXPAL's Abad said that final validation of the 105mm round has recently been carried out at maximum operative charges (L118 supercharge) in adverse environmental conditions, with a perfect functioning score.

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Left Field Suppliers

(sb) The ability to manufacture heavy artillery ammunition “in-country” seems to be one of the core competencies that nations seek to retain and expand: within Europe there are artillery ammunition manufacturers in almost every country with claims or aspirations to a “modern” defence industry. These range from Scandinavia, where Bofors/BAE Systems (Sweden) and Nexter (France) developed the BONUS 155mm BB corrected-trajectory round (subsequently EXCALIBUR); to Serbia, where Yugoimport supplements its formerly Soviet arsenal with relatively cheap but high-quality 155mm ammunition, including a 56km HE ERFB RA/BB (VLAP) round; through Poland, where Dezamet (a company of the PGZ Group) signed a 2019 contract for the delivery of 24,000 155mm rounds. It is, however, clear that manufacturers outside the US struggle to reach comparable economies of scale as those offered by US companies, due to the unavoidable confluence of budgets and demand: competitors must meet US manufacturers head-on in terms of price, quality, and production capability. In terms of moving away from Soviet calibres, progress in Eastern Europe has been slow, reflecting the highly competitive market, lack of budgets for investment in alternative, NATO-specific calibres, and a sustained, buoyant demand for cheap ammunition to service older guns, for example in Africa, where, among others, the big players from India (OFB) and Pakistan (POF) are active and successful. Romtehnica in Romania and Arsenal in Bulgaria are prime examples. One company that has made the transition is ZVS, a company of the MSM group, whose NATO-qualified 155mm rounds offer an excellent, tested product at highly competitive rates. In addition to range-enhancing techniques and technology, precision guidance addenda (such as the M1156 PGK from Orbital ATK (now part of Northrop Grumman) and IEC) and, in particular, developments in fuses and propellants are avenues being actively pursued by R&D establishments and by the manufacturers themselves. *(More on European developments in ESD 5/2020 – Ed.)*

Photo: MSM



155mm artillery ammunition from Central and Eastern Europe. The photo shows, from left to right, the 155mm M107, 155mm HE ER BB, and the 155mm HE ERFB BB rounds developed by MSM, a company within the ZVS Group of Slovakia. These munitions have all passed the full range of NATO and national European tests and trials, and are NATO codified.

In terms of the company's latest 155mm round developments, one of EXPAL's latest rounds, which highlights advances in manufacture, range and effect, e.g. splinter patterns/shrapnel effectiveness/lethality, is its Extended Range ER02A1 HE BB (Base Bleed) round, which it says delivers a far greater range than standard US M107 designs.

Quest for Extended Range

While we have established that both 105mm and 155mm have their respective places in future conflicts, it is fair to focus

on some of the ER 155mm developments that will play a hugely important role in future LRPF and ERCA applications.

One maker that has focused much effort extending the range of 155mm ammunition systems using Base Bleed tech is Nammo with a full family of 155mm munitions that includes IM HE-ER, Illum-ER/IR Illum-ER, RP Smoke-ER. The company already provides the BB component for the Excalibur precision-guided shell.

At Eurosatory in June 2018, Nammo rolled out its extreme range artillery concept that uses ramjet propulsion to suit the requirement for future LRPF. This

Photo: EXPAL



HE rounds continue to be the most widespread, in-demand projectiles.

cutting-edge propulsion is, amongst other things, intended to be used to send a 'new' 155mm shell from a standard SP gun out to ranges potentially over 100 km. Using ramjet tech, the 155mm shell's solid-fuel rocket motor has the ability to bring air into the system enabling it to burn much longer than a typical rocket motor and thereby extend the range of the round. With the move away from L39 barrels to L52/L58 this has given ammunition makers new opportunities to use more than one range-extension technology for the rounds without the need to modify existing L52/L58-calibre systems. With Base Bleed, for example, a burning grain reduces the shell's drag for between 35 and 50 seconds without adding any net thrust; fired from an L52 barrel this will increase the range of the shell from 30 to 40 km with a flight time for

the farthest range of around 117 seconds. Next, using Rocket Assisted (RA) technology to extend a shell's range, a rocket grain is used to add net thrust to the projectile for between 10 and 15 seconds. From an L52 gun this will have the effect of increasing the range from a standard HE shell's farthest unassisted 30 km to between 60 and 80 km with a farthest range time of flight around the 145-second mark. However, when it comes to a Ramjet's solid fuel motor, this adds net thrust to the projectile for between 30 and 40 seconds and enables maximum ranges around 150km to be achieved.

Last summer, NAMMO signed a teaming agreement with Boeing to jointly develop and produce what it says will be the next generation of ER artillery projectiles aimed at meeting the growing need by

Photo: TG ESD



Nexter's KATANA 155mm round can be fired from all 52 calibre artillery systems. It has a multi-mode rocket, which is programmable in order to deliver the payload with proximity, impact, or delay effect.

US and allied forces to address the range gap between their own artillery systems and those operated by potential adversaries. In a statement the company said the US Army ranks the introduction of LRPF as its highest acquisition priority, with several allied countries also showing interest in acquiring similar capabilities. This 25-year agreement will see work performed by Nammo's development team at Raufoss in Norway and by Boeing's Phantom Works advanced research division in St. Charles, Mo.

A Sub-Calibre ER Footnote

VULCANO is a family of unguided, Ballistic ER (BER) and Guided Long Range (GLR) ammunition that includes 155mm rounds for field artillery systems and gives 155/52-calibre and 155/39-calibre guns the capability to extend their operative range and precision beyond normal limits of such weapons. The VULCANO 155mm projectile is actually a sub-calibre, fin-stabilized airframe, compatible with the use of standard modular charges, and no need for ad-



Photo: US Army

An M109 PALADIN at Fort Bliss, TX, fires into the Oro Grande Range Complex NM. PALADIN has been the "go-to" SP gun for many years, but increasingly lacks the ability to make full use of the range capabilities of modern 155mm ammunition.



Photo: BAE Systems

BAE Systems currently has an insensitive munition (IM) under trial for 105mm artillery rounds. The next generation of explosive fill combines what the company calls 'world-leading' IM characteristics with optimised explosive effects on the target.

Photo: US DOD



From short / medium range, agile and versatile 105mm guns to medium / long range heavy guns, artillery has the capability to shape the battle in asymmetric as well as conventional warfare, and in both open and urban terrain.

ditional propulsion of any kind. The round is loaded with Insensitive Explosive and patented, pre-fragmented tungsten rings, while the mechanical interfaces of the system are the same as in standard 155mm ammunition. The rounds are multi-function offering Altimetric/Proximity, Impact, Delayed Impact, Time, and Self-Destruction

modes set using a programmable fuse. In its GLR configuration the round uses canard control actuated by an IMU + GPS guidance system for navigation, which enables a gliding trajectory and the possibility of terminal guidance when used in conjunction with an optional Semi-Active-Laser (SAL).

Photo: UK MOD



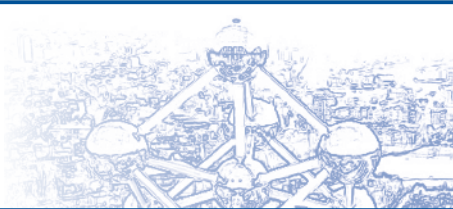
Procuring new ammunition and driving the modernisation of ammunition types for both 105mm and 155mm systems is an ongoing imperative.

The VULCANO family of Precision Guided Munitions (PGMs) has been developed under contract to the Italian Government by Leonardo and Diehl Defence. In Q4 last year, it was announced that qualification tests for the naval 127mm version of the round had been completed and that the qualification tests for VULCANO 155mm round, both adhering to German and Italian requirements, were close to completion and that once done the round would be compatible with all 155mm weapon systems and would be ready to be fielded operationally.

In fact, the 155mm ammunition has already been tested for operational use by the Italian Artillery. In a statement, it was announced the fire command unit 'pFCU' with embedded 'NABK' fire command computation program had been successfully tested by the artillery for V155mm ammunition and used with towed FH70 and SP PzH2000 guns. Integration of VULCANO 155mm into the PzH2000 weapon system and another ammunition program for the German Army is currently being carried out. The achievable extended range for the 155mm round is 70 km. The ammunition achieves its highest target accuracy by combining satellite-based navigation with laser or infra-red sensors for terminal homing.

A Final SMarT Footnote

While space precludes mentioning every munition loosely coming under the remit of this article Rheinmetall Defence's supply of an extensive array of 155mm ammunition is worthy of note; rounds are made for a wide variety of weapon systems and missions at long ranges of engagement, not least of which is for the company's own PzH 2000 self-propelled howitzer – armed with a 155mm L52 main gun – in use with the likes of the Bundeswehr. One of the company's latest and most sophisticated 155mm munitions is the intelligent, autonomous SMarT155, which is a highly effective sensor-fused, fire-and-forget artillery projectile. Known by the Bundeswehr as the DM702, the SMarT155 can be fired from any 155mm gun and is equally effective against stationary as moving targets, enabling artillery to engage lightly and heavily armoured vehicles in top attack mode in all weathers and in all types of terrain with pinpoint precision. The company's other 155mm rounds include HE shells, some featuring insensitive explosives, illumination rounds for the visible and IR spectra, multispectral smoke/obscurant projectiles, and practice ammunition. ■



Viewpoint from Brussels

The EU and the Migrant Crisis at the Greek-Turkish Border

Joris Verbeurgt

The coronavirus crisis has largely supplanted any other news in the European media. However, the fight against COVID-19 is not the only crisis that has to be overcome by the EU.

Start of a New Migrant Crisis?

On 28 February, Turkish President Erdoğan told the thousands of migrants waiting at Turkey's border with Greece that the gates to Europe were open. With this bold step, he practically blew up the 2016 agreement with the EU in which Turkey prevents migrants from entering Europe in exchange for €6Bn. Erdoğan did this because, in his opinion, the EU was not doing enough to stop the refugee crisis in Turkey. This crisis was recently exacerbated by renewed intense fighting over the rebel-held town of Idlib in northern Syria. It is estimated that up to one million new refugees from Syria could flee to Turkey to join the 3.5 million refugees that Turkey is already caring for.

However, Greece refused to let the migrants pass and suspended asylum applications for anyone who tried to cross the border illegally. Soon riots broke out and the Greek police had to use tear gas to prevent the migrants from entering the country. As a result, the tensions between Turkey on the one hand and a furious Greece and a feeble EU on the other increased dramatically. Brussels wondered what game Erdoğan was playing. Did Turkey really have an uncontrollable refugee problem with the Syrians fleeing from the Idlib region? Did Erdoğan simply want more money? Or did he want to force the EU to exert more pressure on Russia and its ally, Syrian President Assad, to stop the offensive in the Idlib region?

The EU Takes a Firm Stance

Whatever the real reason, the EU concluded that Erdoğan was playing a cynical 'power game' with the migrants as pawns. From the outset, the EU did not want a repeat of 2015, when more than a million migrants and refugees were allowed to move around Europe without restrictions. This would spell the end to the Schengen Agreement and the introduction of internal border controls unless the EU was able to defend its external

borders. Austrian Prime Minister Sebastian Kurz has been very clear on this issue. Five days after the opening of the border in Ankara, the President of the European Commission Ursula von der Leyen and the President of the European Council Charles Michel, accompanied by the Greek Prime Minister Kyriakos Mitsotakis, visited the Greek border town of Kastanies. They explained the EU's policy towards the crisis, starting with von der Leyen's promise of unity. In short, the EU would not allow the migrant crisis to become a destabilising factor, as it did in 2015 and Erdoğan's instrumentalisation of the migrant crisis was condemned and rejected. The EU immediately pledged 700 million euros in aid to Greece and gave further details of a European intervention force to be deployed in the region to assist Greek authorities. Amidst the migrant crisis and rising tensions, a Greek refugee home on Lesbos was set ablaze on 8 March.

Two weeks after provoking the crisis, Turkey began to calm down due to the EU's firm stance. Ankara began to de-escalate the stand-off by transporting migrants back to Istanbul at the border. On 13 March, Greek officials declared that the number of attempted border crossings had dropped from thousands per day to several hundred, and that none of them had been successful. On the same day, in Turkey, three human smugglers were each sentenced to 125 years in prison for their involvement in the death of the Syrian infant Alan Kurdi, whose drowning in 2015 was in the news for weeks and epitomised the migration crisis of that year.

Erdoğan Wins Anyway

On 17 March, the leaders of Turkey, Germany, UK and France, unnoticed by the media because of the coronavirus crisis, held a video conference to resolve the conflict. In this appeal, Chancellor Merkel committed herself to respect the 2016 pact, which pays Turkey for the restraint of migrants. Angela Merkel told Erdoğan that she was prepared to increase EU funds for refugee relief in Turkey if, in return, Ankara prevented thousands of refugees from crossing the Turkish-Greek border. Leaders also agreed that they should 'not lose sight of' the stalled talks on expanding the EU-Turkey customs union.

Guided and Unguided Rocket Artillery

Doug Richardson

When US citizens sing the line "And the rocket's red glare" that forms part of their national anthem, probably few realise that the red glare in question was from Congreve rockets fired by British forces during their attack on Fort McHenry in Baltimore during the War of 1812.

Developed by Sir William Congreve in 1804, these rockets remained in use until the 1850s. Their inventor liked to claim that since his rockets could be fired from lightweight launchers rather than from heavy towed guns, they represented "the soul of artillery without the body". But what the US Smithsonian Institution once described as "The First Golden Age of Rocketry" was soon over, eclipsed by improved versions of conventional artillery weapons that offered greater range and accuracy.

One problem with conventional artillery is that if long range and/or a heavy projectile are required, the resulting weapon will be large and heavy, so the US and the Soviet Union developed unguided rockets able to fill this role. Classic examples were the US MGR-1 HONEST JOHN and the Soviet 9K52 LUNA-M. Both were in the two tonne weight class and had maximum ranges of 48 km and 70 km, respectively. Since they were unguided, the accuracy of both weapons was poor - the final version of HONEST JOHN had a typical miss distance of 250 m, while the Luna-M had a circular error probable (CEP) of 500-700 m. One former operator of the HONEST JOHN told this writer that even with a nuclear warhead, the weapon was near useless.

The concept of the heavy artillery rocket still has adherents. Iran used the LUNA as the basis for its 610mm ZELZAL. In its ZELZAL-1 form, this had a range of 125-160 km with a 600 kg warhead, while ZELZAL-2 can manage 210 km. But since these missiles are unguided, they are likely to fall up to 10 km or more from their aim point. Most variants of Pakistan's

Photo: UK MoD



Seen at Camp Bastion in Afghanistan during the British Army deployment to that country, this M270 MLRS launch vehicle is fitted with slat armour intended to protect it from RPG attacks.

HAFT 1 560mm rocket have ranges of 70 or 100 km and carry a 500 kg warhead, and are likely to be fairly inaccurate.

At shorter ranges, the unguided rocket still has a useful role, with weapons in calibres typically ranging from 122-300mm being fielded on multi-round launchers, the latter often vehicle-mounted. These rockets are normally powered by solid-propellant motors, and the simplest type of warhead carried is of the high-explosive type. Typical alternatives include fuel-air explosives, submunitions and anti-tank mines, but some latest-generation rockets have warheads of greater sophistication. For example, one of the munitions available for China's WS-2 400mm rocket system is a round with a payload of three anti-radar UAVs.

With all but the largest calibres, rounds are often deployed on multiple rocket launcher (MRL) vehicles. While some types use rockets that are loaded individually, it is more efficient to have a number of rockets prepacked into a single pod. MRL vehicles are often accompanied by several types of support vehicles. These can include a command-and-control vehicle, a radar-equipped fire-control vehicle, ammunition resupply vehicles and even one or more field-maintenance vehicles.

Given that around 30 countries have developed artillery rockets, it is impossible to document all of these weapons in a single magazine article, but the text which follows will describe a selection of the available hardware.

Originally known as the General Support Rocket System (GSRS), the Lockheed

Author

Following an earlier career in engineering, **Doug Richardson** is a defence journalist specialising in topics such as aircraft, missiles, and military electronics.

Martin M270 MLRS teams the M269 Loader Launcher Module (LLM) with the M993 derivative of the Bradley Fighting Vehicle chassis. The system was originally designed to use two six-round pods of 227mm rockets. An alternative pod housing a single MGM-140 ATACMS missile is also available, but this guided weapon lies outside the scope of this article. The M26 rocket had a payload of 644 M77 Dual-Purpose Improved Conventional Munition (DPICM) submunitions, and a range of 32 km. There was also a 45 km-range M26A1 Extended Range Rocket (ERR) armed with 518 M85 submunitions. Germany developed the AT2, a 38 km-range rocket with a payload of AT2 anti-tank mines.

Photo: via author



Although deployed by at least 20 countries, the Soviet-era LUNA-M (FROG-7) heavy artillery rocket offered only mediocre accuracy, so was of limited tactical usefulness.

Highly Mobile Systems

To meet the need for a lighter and more mobile MLR system, the US developed the Lockheed Martin M142 High Mobility Artillery Rocket System (HIMARS). Based on a variant of the standard Army M1140 five-tonne truck, this carries either a single six-round rocket pod, or a single pod with an MGM-140 ATACMS missile. Russia currently fields the 122mm BM-21 GRAD, 220mm URAGAN, and 300mm BM-30 SMERCH (Tornado) MRL systems, but these are being replaced by more modern weapons. The 9A52-4 SMERCH (TORNADO) entered service in 2014 in its basic 122mm TORNADO-G form as a replacement for the BM-21 GRAD. It was followed by the 220mm 9A53-U TORNADO, then the 300mm TORNADO-S. Russia currently offers a range of more than 20 specialised rockets in 300mm calibre. These include the 9M55K with a

maximum range of 70 km and a payload of 72 unguided fin-stabilised high-explosive fragmentation submunitions, and the 9M55K1 which carries five BAZALT State Research and Production Enterprise MOTIV-3F parachute-retarded anti-armour submunitions. These weigh 15 kg and are guided by a two-colour IR seeker. A 9M500 series of 300mm rockets with a maximum range of 90 km has also been developed. It includes the 9M530 which carries a warhead designed to penetrate

buildings, and the 9M531 whose submunitions are optimised for use against personnel and vehicles.

China offers what is probably the greatest range of artillery rockets available from a single country. These range in calibre from 122mm to 400mm. Turkey is another major supplier, with Roketsan marketing 107mm, 122mm, 230mm, 300mm, and 610mm rockets.

Some manufacturers have managed to increase the accuracy of unguided rockets. Developed by the Belgrade-based company EDePro (Engine Development and Production), the G-2000 122mm rocket designed for use from the Soviet-era GRAD MRL has almost double the range of the original projectile, but has a CEP less than 25% of the older weapon. This improved accuracy was obtained by keeping a tight control over the weight tolerance and thrust-impulse tolerance of the new round.

In July and August 2006, the Israel Defence Force was to learn the truth of Congreve's claim that rockets represented "the soul of artillery without the body". During what is often termed the Second Lebanon War, their country was targeted by barrages of rockets fired from small and easily-concealed launchers by Hezbollah forces. Often of Syrian origin, these rockets included the 30 km-range 122mm GRAD, 70 km-range 220mm rocket, and 100 km-range 302mm rocket. Most were



Photo: MoD Russia

Russia's BM-27M URAGAN-1M consists of a ZIL-135 8x8 chassis able to carry two six-round launchers for 220mm rockets.



Photo: IDF

Artillery rocket technology is simple enough to allow weapons to be manufactured by irregular forces such as Hamas. These launchers and QASSAM rockets were captured by the Israel Defence Forces during combat operations in Gaza.

122mm rockets able to deliver a warhead of up to 30 kg to a range of up to 30 km. Similar rocket bombardments conducted by Hamas forces in Gaza were to be a feature of conflicts against Israel between December 2008 and January 2009, in November 2012, and July 2014.

Counterstrikes

In this type of warfare, sensor-to-shooter time for operations against missile launchers and their crews must be minimised. During the 2006 Lebanon war, the reaction time between rocket launches and Israeli air or artillery strikes against the launcher was eventually reduced to about 60 seconds. By the time of conflict against Hamas forces in Gaza in December 2008 and January 2009, Israeli pilots were reported to be engaging targets within 15-20 seconds of acquiring them. For all practical purposes, reloading of launchers was no longer practical, so these became one-shot assets.

While similar fast counterstrikes might be a planned tactic for future military conflicts, it is important to note that despite their use by Israel, this type of counterattack did not prevent significant numbers of rocket launches. Any future conflict between Israel and Hezbollah could see the latter using artillery rockets on an unprecedented scale. Studies conducted by Israel's Home Front Command are reported to have concluded that Hezbollah

now has enough rockets to be able to fire 1,000-1,500 per day.

Guidance Add-ons

One solution to the poor accuracy of artillery rockets is to add some form of guidance. This normally involves fitting the rocket with a satellite-navigation receiver and some form of moving control fins. The result is a weapon able to land within a few metres of its target, rather

than hundreds or even thousands of metres from its aim point.

The XM30 Guided Multiple Launch Rocket System (GMLRS) used by MLRS and HIMARS launch vehicles has a range of 70 km. Initially, these used the M30 guided round armed with 404 M85 submunitions, but the M31 Guided Unitary MLRS and follow-on M31A1 carry a unitary high-explosive warhead suitable for use in urban and mountainous terrain. Diehl Defence demonstrated a M30 rocket armed with four SMARt anti-tank submunitions, but this never saw service. Production Lot 10 of the GMLRS unitary was the first to be armed with the Alliant Techsystems-designed alternative warhead. Weighing 90 kg, this payload is an airburst fragmentation warhead that explodes over a target area to disperse approximately 182,000 preformed tungsten fragments.

In 2019, the US Army tested a Tail Controlled Guided Multiple Launch Rocket System (TC-G). As its name suggests, this uses rear-mounted control surfaces, and features a redesigned nose, and a light-weight composite rocket motor that has an increased amount of propellant. This new configuration is designed to have greater range and improved manoeuvrability, and has demonstrated a range of 139km. The Army has also developed a composite smooth-bore launch tube for the new rocket.

Israel Aircraft Industries (IAI) has developed its own guided round. Four of these Extended Range Artillery (EXTRA) rockets can be housed in an MLRS/HIMARS compatible launch pod. Each rocket weighs

Photo: US Army Combat Capabilities Development Command



Seen here on an early test flight, the new tail-control version of the GMLRS rocket features a more aerodynamic nose, and a composite-cased rocket motor containing more propellant.

450kg and is 306mm in diameter. A GPS-aided inertial guidance system applies trajectory corrections via a gas thruster. Maximum range with a 120 kg warhead is up to 150 km. A similar four-round pod is also available with IAI's 450 km-range Long-Range Artillery (LORA) rocket.

Russia has announced the development of guided rockets with maximum ranges of 120 km and 200 km. These are reported to use guidance based on Russia's GLONASS satellite navigation system, but no other details are available.

As was the case with unguided rockets, China has developed a large number of guided systems. Calibres range from the 122mm of the FIRE DRAGON 40 to the 400mm of the WS-3, -3A and SY-400. Most use internal or GPS-aid inertial guidance, while the 300mm WS-33 combines this type of guidance with an EO terminal seeker. Roketsan uses GPS on its TRGK-300 add-on kit for 300mm rockets, and GPS-aided INS guidance in its TRG-122, TRG-230, and TRG-300 TIGER guided rockets.

Although of limited usefulness in their unguided forms, some types of heavy long-range rockets are also being produced in guided variants. Iran's 330mm FAJR-5 unguided rocket formed the basis of the course-corrected FAJR-5C, which uses a GPS-based guidance system.

FATEH A-110 is a guided version of the unguided ZELZAL-2. Several variants are known to exist; all use GPS-aided inertial guidance to provide a CEP to 250m at ranges of up to 300 km. The addition of a nose-mounted seeker for terminal homing resulted in a new and more accurate variant designated KHALIJ FARS. Syria has created its own M-600 TISHREEN version of the FATEH A-110, while Pakistan added inertial guidance to its HATF 1 series in order to create the more-accurate HATF 1B version.

Photo: SPLAV



Russia's Splav conducted initial tests of a guided rocket for the 300mm SMERCH system some 15 years ago. It now boasts that its latest-generation of 300mm rockets features a "self-contained powered flight phase control system" that provides an accuracy of 0.23% of range.

"Smart" Bombs

One novel route to developing a guided rocket capability is to mount an existing 'smart' bomb onto a rocket, so that the latter can deliver the bomb to a location from which its own guidance system can steer it to an accurate impact point. An early example of this approach is the KO-SAVA rocket offered by Serbia's Yugoimport SDPR. This mates an off-the-shelf 262mm rocket motor with a LVB-250F laser-guided bomb.

A more sophisticated example is the Ground Launched Small Diameter Bomb (GLSDB) developed by Boeing and Saab. Flight tested in 2015, this uses a NAMMO rocket motor based on the technology of the M26 rocket from the MLRS to carry a Boeing GBU-39/B Small Diameter Bomb I guided bomb. Once released from the booster, the bomb deploys its wings and begins a guided flight to the target under the control of its GPS-aided inertial navigation system.

Unguided artillery rockets are by no means obsolete. They can still deliver suppressive fire or deliver payloads such as high-explosive warheads and bomblets. But given their high accuracy, guided artillery rockets pose a much higher threat than their unguided counterparts, so are likely to play a major role in future conflicts, delivering accurate fire against targets beyond the effective range of conventional towed or self-propelled guns. Although originally developed and fielded by only a handful of countries, guided-rocket technology will inevitably trickle down to other regular or even irregular armed forces. In 2014, Iran stated that it had delivered FATEH-110 guided rockets to Hezbollah. Given its experience in the face of rocket attacks from Gaza and Lebanon, Israel makes no secret of its concern that guided rockets may form a highly-damaging component of any future conflict with Hamas or Hezbollah. ■



Photo: Yugoexport - SDPR

Serbia's Yugoexport - SDPR - created the KOSAVA 'smart' rocket by combining a solid-propellant rocket motor and an LVB-250F semi-active-laser (SAL) guided glide bomb.

The LYNX

A New Family of Tracked Vehicles

Michael Horst

The infantry fighting vehicle fleets currently in service have become 'outdated' for many land forces. Around the world, militaries are searching for high-performance, future-proof solutions that meet the new requirements in terms of effectiveness, survivability, mobility and versatility.

To meet the current and future capability requirements of modern armed forces for medium-weight tracked vehicles, Rheinmetall's LYNX family is a future-proof, cost-effective and - due to its extremely modular design - innovative solution.

opment, presented for the first time at Eurosatory 2018.

LYNX vehicles are currently available in two weight classes. The LYNX KF31 weighs up to 38 tonnes and can carry three plus six soldiers. The LYNX KF41 is slightly larger and can carry three plus

The modularity of this vehicle family was impressively presented to an international trade audience at Eurosatory 2018. Within a few hours, the LYNX was converted from an infantry fighting vehicle into a command vehicle. This was made possible by the mission modules developed by Rheinmetall. These mission modules can be installed in the roof cutout of the LYNX or deployed as a stand-alone solution (in standard ISO containers) and used, for example, for training purposes.

A Vehicle Family: Common Logistics, One Provider

The entire LYNX family is characterised by a high degree of spare parts commonality. This has a positive effect not only on logistics but also on training. Rheinmetall also offers customised services worldwide, ranging from training, supply and maintenance (even in the operational areas) to technology transfer.

Key Capabilities

LYNX vehicles offer a unique blend of effectiveness, survivability, agility, command and control and versatility. On the one hand, Lynx relies on advanced technology and concepts, and on the other hand on proven technologies in order to significantly reduce technical risk.

A special feature of the LYNX KF41 is the removable cover of the roof cut-out of

Photo: Horst



LYNX on display at Eurosatory 2016

Photo: Horst



LYNX 41 at Eurosatory 2018

Versions

A variant of the Lynx vehicle family - the Lynx KF infantry fighting vehicle (tracked vehicle in the 30-tonne class) - was presented by Rheinmetall for the first time at the Eurosatory trade fair on June 14, 2016. At first glance, this version resembled the MARDER infantry fighting vehicle. In contrast, the new LYNX KF41 combat vehicle is a entirely new devel-

opment, presented for the first time at Eurosatory 2018. LYNX vehicles are currently available in two weight classes. The LYNX KF31 weighs up to 38 tonnes and can carry three plus six soldiers. The LYNX KF41 is slightly larger and can carry three plus

A Versatile Medium Tracked Vehicle Family

LYNX tracked vehicles provide superiority on the battlefield and are well suited for all types of operations - from peacekeeping missions to high-intensity combat in national and alliance defence. They are highly protected, adaptable to various operational environments, extremely agile and powerful and have high payload reserves.

In June 2016

Ben Hudson, at the time head of Rheinmetall Vehicle Systems Division, said: "LYNX is an advanced new modular vehicle family. It offers the highest levels of survivability, agility, effectiveness and performance, using proven technologies to deliver convincing value to our customers. With its capabilities, LYNX enables the user to fight and prevail on the battlefields of today and tomorrow".

Photo: Rheinmetall



IFV LYNX 31

Photo: Rheinmetall



IFV LYNX 41



Photo: Weisswange

LYNX turret: Right side of the turret (seen in driving direction) with exemplary armament and equipment. The right weapon pod is open and has a launcher with two SPIKE anti-tank guided missiles. Also pictured are the smoke discharger, sensors of the Situational Awareness System and, as secondary armament, a RMG 7.62.

the hull. This allows the combat compartment to be fitted with a high roof within a few hours, for example, to create more volume for additional mission equipment or to achieve greater headroom. It is up to the customer and user to decide which equipment is to be accommodated in the various versions.

Effectiveness

The standard LANCE turret, by Rheinmetall Defence, can be equipped with a 30mm or 35mm automatic cannon.

It can be reloaded under armour protection and has been designed to fire airburst ammunition against aircraft or lightly protected land targets. It can engage targets up to 3,000 metres or 3,500 metres – even in the air – with high precision.

The LANCE 2.0 turret is the next generation of the already operational LANCE family. Depending on customer requirements,



Photo: Horst

LANCE 2.0 turret with MK30/2 on an acceleration and simulation test frame at the Rheinmetall plant in Unterlöß



Photo: Rheinmetall

WOTAN 35: calibre 35mm x 228, rate of fire 200 shots/min, ABM technology (Air Burst), ITAR-free

it can be equipped with various weapon systems up to 50 mm MK. It has been custom-designed for use in infantry fighting vehicles and can be delivered crewless or in a two-person crew version, depending on customer requirements. The turret, which has been upgraded in terms of combat value, provides better protection for mission-critical subsystems against kinetic threats and fragments. This improves the survivability of the subsystems in combat situations, especially in urban areas. Another improvement is Rheinmetall's new WOTAN 35 electrically powered automatic cannon. With a rate of 200 rounds per minute, it fires Rheinmetall's tried-and-tested family of

Masthead

European Security & Defence

Issue 4/2020, April 2020

ISSN 1617-7983 · www.euro-sd.com

Published by

**MITTLER
REPORT**

Mittler Report Verlag GmbH
A company of the Tamm
Media Group

Publisher: Stephen Barnard (sb)
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Layout:

CREATIVE CONSULTING GmbH, Germany

Production:

Lehmann Offsetdruck GmbH

22848 Norderstedt, Germany

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European Security & Defence

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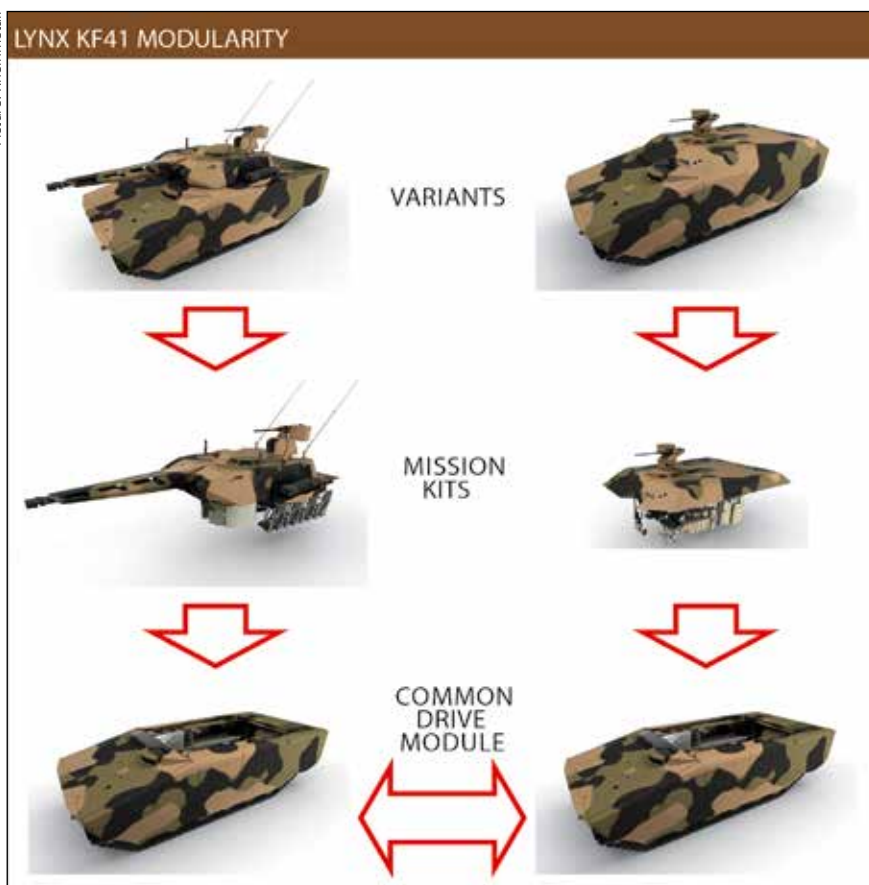
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Cover Photo: Nexter Systems

Annual subscription rate:

€64.90 incl. postage

Picture: Rheinmetall



Interchangeability of the drive and mission modules

35 mm x 228 medium-calibre ammunition currently in service.

Furthermore, the LANCE 2.0 turret has a flexible mission pod on each side of the turret. These pods allow the installation of various subsystems to provide the turret with additional capabilities. Customised mission pods include, for example, a twin launcher for Rafael's SPIKE LR2 anti-tank guided missile (over 5,000 metres), a launcher for loitering

ammunition, a launcher for reconnaissance drones or equipment for electronic warfare.

The fire control of the anti-tank guided missile is fully integrated into the sight and fire control of the gunner. The commander can observe and act independently of the gunner via a weapon station connected to the main optics. This gives the Lynx not only a 'hunter-killer' but also a 'killer-killer' capability.

Photo: Horst



The command and control version at the Rheinmetall plant in Unterlüß: note the low profile.

Resilience

The entire protection system is modular and expandable. The hull and turret feature a high degree of protection and can be upgraded to an even higher protection level as required. Various protection kits are available for this purpose. LYNX modular protection systems offer a high degree of flexibility to cope with the wide range of threats across the conflict spectrum. The ballistic protection elements and mine protection kits can be easily replaced, even in field conditions, if required. Roof protection and mine-protected seating has also been considered. The LANCE 2.0 turret of the LYNX KF41 is designed to accommodate passive and reactive protection elements. It can also accommodate - upon customer request - a stand-off active protection system for defence against anti-tank rounds and anti-tank guided missiles. It also features a combined air-conditioning and NBC protective ventilation system with NBC protective filters from Beth El.

The vehicle design also contributes to the reduction of visible, thermal, acoustic and radar signatures. For example, exhaust gases are emitted together with the cool exhaust air from the air conditioning system at the rear of the vehicle. As an option, Rheinmetall's mobile camouflage system SolarSigmaShield can also attenuate visual, thermal and radar signatures.

Modularity

The LYNX family of vehicles can be configured for a wide range of applications and consists of a driving module and flexible mission equipment. This allows each base vehicle to be configured for a variety of desired capabilities. Configuration changes can be achieved within hours. As the base vehicles are identical, this system significantly reduces life cycle costs. The subsystems of the LYNX KF41 are also highly modular and adaptable, further increasing the flexibility of the vehicle.

The company has designed a total of 17 different versions of mission modules (including infantry fighting vehicle, command vehicle, armoured reconnaissance vehicle, battle damage repair vehicle, armoured medical evacuation vehicle, armoured personnel carrier and armoured recovery vehicle), of which 10 variants and one driver training variant are currently available as prototypes.

Mobility

The LYNX KF41 offers the latest drive technology with an 850 kW (1,140 hp) in-line diesel engine from Liebherr and a

proven Renk HSWL 256C automatic superimposed steering gear. This transmission is also installed on the PUMA infantry fighting vehicle in the German Army. When the vehicle is stationary, the engine is able to provide electrical power at reduced output - and thus also reduced noise levels - on a continuous basis.

The flexible drive system allows the LYNX KF41 to remain highly mobile even when configured with mission equipment and protection kits. The six-roller torsion bar suspension system incorporates Supashock absorbers. A weight-reduced track made of special steel from Defence Service Tracks is used. In the infantry fighting vehicle version, the LYNX KF41 has a weight of around 44 tons. In this configuration, its power-to-weight ratio of 19.3 kW/t offers a high degree of mobility for this class, with a reserve of six tons of payload available for further growth.

Command and Control

The LYNX KF41 has a "digital backbone" with a generic open architecture. This allows easy integration of new mission systems and is essential for future use on the digital battlefield. The 24 Volt based electronic architecture is (NATO) Generic Vehicle Architecture (GVA) compliant and consists of an integrated computer system with WinBMS command and control system. This - as well as the entire equipment with electronic/electrical devices - is supplied with electrical energy by two generators with a total of 600 A.

International Activities

Since its introduction in 2018, the LYNX KF41 is the only new armoured platform that has already taken part in three international competitions: in Australia, the Czech Republic and the US. The vehicle, which was designed as a vehicle family,

Photo: Rheinmetall



LYNX KF41 – air transport to Australia

can be flexibly adapted to the requirements of military customers due to its modular structure. 17 different variants are on the customers' competition books: from infantry combat vehicles with turret and up to 50mm MK, through command and reconnaissance tanks (with turret) to armoured engineer, recovery and medical vehicles (without turret).

In particular, the modularity allows for the participation of national industrial partners in order to meet the demands for technology and know-how transfer as well as for value creation in the own (recipient) country. With unit numbers of 400 (Australia), 210 (Czech Republic) and up to 4,000 (US), the programmes have considerable financial weight. Initial decisions on the selection of competitors were already made last year.

LYNX for Australia

The LAND 400 Phase Three programme in Australia will replace the M113 armoured personnel carriers and provide the armed forces with advanced vehicle

equipment. The Australian Army is looking for a powerful and highly protected infantry combat vehicle. The planned €8.5Bn investment should take another important step forward in 2020.

In the competition for the new infantry combat vehicle, as part of the Land 400 Phase 3 armaments programme, the Australian MoD has selected two competitors, Rheinmetall (with the LYNX KF41) and Hanwha (with the AS-21 REDBACK), for the Risk Mitigation Activity (RMA) phase. GDLS (ASCOD 2) and BAE Systems (CV90 Mk IV) are no longer in the running. The vehicles of both competitors weigh about 42 tons, are designed for a crew of three plus eight soldiers and are equipped with a 30mm cannon as the main weapon. The AS-21 REDBACK is based on the K21 produced since 2009, while the LYNX KF41 is an entirely new design.

Australia has contracted Rheinmetall to participate with the LYNX KF41 infantry fighting vehicle in the trial phase of the Land 400 Phase Three armaments project. A contract to this effect was signed in mid-October 2019, which also includes the delivery of three LYNX KF41 demonstrators. In the infantry fighting vehicle version, they feature the digital LANCE turret with electronic architecture, also used in the BOXER 8x8 CRV. This enables the crews to access sensor systems, advanced automatic positioning and targeting functions and weapon-integrated combat control in a network-capable platform.

The new Military Vehicle Centre of Excellence (MILVEHCOE) in Australia is already involved in the development, integration and testing of the LYNX KF41 vehicles to support the upcoming RMA tests. Should

Photo: Hanwha



The AS-21 by Hanwha



Photo: Rheinmetall

LYNX for the Czech Republic

Rheinmetall be awarded the contract for series production, it is planned to manufacture the LYNX KF41 fleet also at MILVEHCOE in Redbank Plains, south-west of Brisbane. Key vehicle elements of the LYNX KF41 are developed and manufactured in Australia by companies based there. These include the alternator (Milspec in Albury), the chassis (Supashock in Adelaide) and cables (Cablex in Melbourne).

Under the LAND 400 Phase Three RMA contract, Australia will conduct a comprehensive technical and programme evaluation of the two remaining bidders over a period of 24 months. The vehicles will be operated by members of the Australian armed forces and tested under extreme conditions in domestic terrain. The vehicles will be operated by members of the Australian armed forces and tested in Australian terrain under extreme conditions, assessing their effectiveness, transportability, mobility and troop fitness, as well as conducting explosion and ballistic tests. In parallel, a structured evaluation phase will be conducted with bidders to optimise technical performance, scalability, value for money and national economics. According to current planning, a proposal for a decision on the preferred bidder for the provision of LAND 400 Phase Three capability is to be submitted to the government for consideration in 2022. Initial Operational Capability with the new vehicle is scheduled for 2024 to 2025. Equipping the new vehicles should be completed by 2031.

LYNX for the Czech Republic

At the International Defence and Security Technologies Fair in Brno (Czech Republic)

at the end of May 2019, the LYNX - in the version suitable for competition in the Czech Republic - was on display, with a total of four companies showing possible solutions. Equipment relating to weapons, observation, targeting and fire control as well as communication and other electronic devices were presented as a configuration proposal, as the final requirements of the customer remain confidential. Due to the required involvement of Czech industry, the choice of industrial partners will have an impact on the selection of systems and components. At present, BAE Hägglunds, General Dynamics and Rheinmetall are still involved in the selection process and a decision is expected soon.

Photo: Rheinmetall



LYNX 41 at AUSA 2019 in Washington, D.C.

LYNX for the US Army

The Optionally Manned Fighting Vehicle (OMFV), which is scheduled to go into series production with the US Army from 2026, is to replace the BRADLEY infantry fighting vehicle. The new vehicle will be optimised in line with the US Army's requirements for combat in urban terrain as well as in difficult terrain, with the OMFV project being given the highest modernisation priority.

In the competition for the OMFV, Rheinmetall and the US group Raytheon set up a US joint venture in 2019. Based in Detroit, US, the company operates under the name Raytheon Rheinmetall Land Systems LLC. The Raytheon technology to be used in the LYNX primarily includes the company's future-proof weapon systems, such as the TOW anti-tank guided missile, an active protection system, third-generation vision systems, the COYOTE unmanned aerial vehicle system and cyber-threat defence systems.

Following harsh criticism about the competition being conducted with only one participant, the US Army stopped the OMFV programme in mid-January 2020 and relaunched it with another market survey a month later. Under the new initiative, the Army Futures Command is operating with problem descriptions (capability requirements) and expects the industry to propose appropriate solutions. In the next step, digital design competitions and feedback from the soldiers will be used as a basis for a detailed description of the vehicle characteristics. Digital prototypes should enable an assessment of the overall systems. In

the end, two main contractors are to each build one physical prototype, which is to prove its practicality in tests.

Potential for Development

LYNX on the Digital Battlefield

Future active systems are on the threshold of remote-controlled - and possibly autonomous - use worldwide. Considerable progress is expected in the next few years with the Main Ground Combat System and the Common Indirect Fire System, which is to be implemented with French and German cooperation – an intention bolstered by considerable Research and Development funds. The first unmanned infantry fighting vehicles will appear on the battlefield – a logical step in order to fully exploit the capabilities of the systems and protect the lives of soldiers when simple actions can be left to the machines and do not require the presence of a human being.

With regard to the existing electrical architecture and the available protected volume and weight reserves, the LYNX family offers excellent opportunities in terms of accommodating the multitude of technical equipment (information transmission, processing and display, battle management, energy storage) in order to be able to prevail on the digitalised battlefield of the future. This is also the basis for growth in digitisation. At present, there is no fully digitisation infantry fighting vehicle, although some solutions are either available or under development and only need to be integrated into the system.

New Effectors

The volume reserve available on LYNX offers the possibility of integrating laser weapons if required by the customer. Certainly, the space required for the necessary energy storage units of these systems is not a challenge for LYNX.

New Protective Technologies

The reserve payload available on the LYNX also allows the implementation of an improved protection system without significant loss of mobility and agility. In terms of threat, new Russian main battle tanks and infantry fighting vehicles represent a leap forward in development technology, which will not only influence a possible new generation of Western developments in combat vehicles, but also require the development of new protection technologies of all kinds. Future threats to combat vehicles - during missions, but also in national and alliance defence - (from

LYNX KF41 Infantry Fighting Vehicle

Specifications: LYNX KF41 — Mounted Combat Operations Configuration

Mobility	Dimensions	7.7 x 3.6 x 3.3m (length/width/height)
	Engine	1,140hp (850kW) Liebherr twin turbo-charged diesel
	Transmission	Renk HSWL 256; 6-speed; automatic
	Max Road Speed	70km/h
	Max Road Range	500+km
	Gradeability	60%
	Side Slope	30%
	Trench Crossing	2.5m
	Vertical Step	1m
	Fording (unprepared)	1.5m
	Track	Lightweight Steel
	Suspension	Torsion bar with swing arms and dampers
Survivability	Combat Weight	34 to 50 tonnes
	Transportability	Landing craft/C-17/C-5/An-124
	Ballistic	Medium calibre cannon, HMG and small arms
	Blast and Mines	Anti-tank mines, IEDs and EFP mines
Lethality	ATGM/RPG	Optional APS and bomblet protection
	Turret	LANCE 2.0; manned
	Main Gun	30mm or 35mm; 200 rds/minute rate-of-fire; 45° to -10° elev/dep
	Co-Axial MG	7.62mm
	RCWS	40mm, 12.7mm or 7.62mm MSSA
Other	ATGM	SPIKE LR2; twin launcher in one or two mission pods
	Optional	Loitering munition, UAV or EW system in mission pod
	Crew	3
	Dismounts	Up to 9
	Sighting Systems	360° independent digital commander's sight (SEOSS-P) and digital gunner's sight (SEOSS-S)
	Situational Awareness	360° TV/ IR cameras networked with SEOSS-P and SEOSS-S
		Automatic target recognition and tracking
		Laser warning and acoustic shooter locating system
		BMS and tactical communications
	Electrical Power	20+kW with twin high capacity lithium battery packs for extended silent watch
	Air-conditioning	Yes
	Fire Suppression	Yes
	NBC Filtration	Yes

incendiary devices and IED effects to medium- and large-calibre KE projectiles) require the optimal coordination of the individual protection components to form a protection system. Technical solutions, for example, soft kill systems, distance-active hard-kill systems, are already available while work is underway to reduce the effect of modern KE projectiles, for instance, by combining passive and explosive reactive armour. Although an optimal protection system costs not only volume but also weight, the LYNX family could, if needed, meet these requirements.

Outlook

Within a short period of time, Rheinmetall has succeeded in realising the prototypes of a new family of tracked vehicles in such a way that the core capabilities required in international competition are broadly met. The LYNX family seems a viable alternative to current competitors' offerings,

especially in terms of modularity, performance, growth capability and price. The possible - and in some cases already realised - participation of the future user states in the integration of sub-systems and the globally available service and training services of a large group in the later use of the system are also good procurement arguments.

Of course, the LYNX family can also benefit from Rheinmetall's entire military activities, for example, protection, weapons and ammunition development and, in particular, developments in the digitalisation of the battlefield.

The important thing now is to succeed in the ongoing competitions. This essentially requires stable prototypes (in-house tests have been conducted) and close company-level monitoring of the tests. Success in competition and the associated introduction of the LYNX family, if necessary, also opens up further national and international procurement potential. ■

Catching up with the West?

Russian Unmanned Aerial Vehicles

Jörgen Elfving

Drones or unmanned aerial vehicles (UAV), defined as remote-controlled aircraft without a human pilot, have their origins in World War One, not only in the US but also in Russia, where in 1916 Staff Captain Yablonsky began building a 'torpedo helicopter', a vehicle which, like its US counterpart the Kettering Bug, was not used during the war.

During the early Soviet period and until World War Two, several experimental UAVs were developed, including a drone based on the TB-3 bomber, some of which may even have been used to destroy bridges in 1941.

Development gained momentum after 1945, and during the 1960s to 1970s two heavy UAVs, the Tu-141 STRIZH (SWIFT) and Tu-143 REJS (FLIGHT or VOYAGE), were built. A total of 152 STRIZH and 950 REJS were produced, both of which were intended for reconnaissance and had a range of 1,000 km and 180 km, respectively. Nowadays, they are no longer used in the Russian Armed Forces, at least not in their original role, but are possibly used as targets for SAMs. However, they are said to have been used by the Ukrainian Armed Forces during the ongoing conflict in the east of the country. In addition to STRIZH and REJS, a number of other smaller UAVs with shorter range and endurance have been developed, including SHMEL with a range of 220 km, which was used during the Chechen war even though it was already outdated at the time. In total, about 15 different types of UAVs were developed in the late Soviet period, and the Soviet Union was one of the leading countries in this field at that time.

Author

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Photo: MoD Russia



The ORLAN-10 UAV at a Russian military exercise in June 2017

A Brutal Awakening

The dissolution of the Soviet Union and the resulting unrest slowed or stopped the further development of UAVs. The lack of such vehicles, among other revelations, became painfully obvious during the war with Georgia in 2008. The available UAVs were the Rejs, which could neither change their trajectory nor transmit images in real time during a mission. Therefore, strategic bombers and attack aircraft had to be used for intelligence purposes. Based on the experiences gained during the 2008 war, it was decided to develop its own UAVs as well as to purchase some abroad. As the local industry was not up to the task at that time, the only option was to procure them from abroad and thus gain worthwhile knowledge and initiate the introduction of UAVs in the armed forces. Therefore, Russia turned its eyes to Israel.

Although Israel initially hesitated to sell its advanced UAVs to Russia because it feared that they might turn up in the wrong

hands, i.e. in Iran and Syria, in the end Israel changed its mind. This was a result of the realisation that when it sold UAVs to Russia, they also had leverage (i.e. the sale of advanced Russian weapons to the two countries in question could be stopped or delayed), which it also used to its advantage, resulting in the sale of the S-300 system to Iran being put on hold in 2010 and not being delivered until 2016. As a result of the contracts signed with Israel in 2009 and 2010, Russia acquired three types of UAVs: the BIRD EYE 400, I VIEW MK150 and SEARCHER Mk II, vehicles that were given the Russian designations FORPOST, NABJODATEL and SASTA-VA, respectively. The contracts also enabled for the Israeli defence industry to supply Russia with equipment for assembly and maintenance, which resulted in the UAVs being assembled at the OJSC Urals Civil Aviation Plant from 2012 onwards. However, in 2014, under pressure from the US, the Israeli government banned the conclusion of new

contracts with Russia, even though spare parts could still be supplied under the previous contracts.

Recognising the need for UAVs and the procurement of Israeli drones, led to intensive activity in the development and introduction of UAVs into the Russian armed forces. In 2010, the Russian Armed Forces decided to set up a department within the General Staff to deal with these issues and, in the same year, an Unmanned Aerial Vehicle Centre was established in Kolomna.

According to Deputy Defence Minister Aleksey Krivoruchko, from 2012 to 2018, the number of UAV units increased from three to 40 and the number of UAVs from 91 to 2,136. The number of UAV units could be even higher since, at the start of 2018, a source named 67 UAV companies. Today, UAV units can be found as UAV companies in all sectors as well as in tank and armoured brigades. In the Navy, the existing UAV units were organised in regiments from 2016 on. However, so far only one such regiment has been established, and that is in the Northern Fleet. Although the Navy still lacks UAV units, they will be created in the near future as part of organisational changes in the Marine Brigades to make them more suitable for use as expeditionary units.

UAV Deployments

Today, UAVs are a natural part of most exercises and are used for information gathering, target acquisition and ECM purposes. In 2019, flight hours for UAVs in the 1st Guard Army were 5,500, which is a 100% increase over the previous year. This figure shows that UAVs are used frequently and increasingly in exercises. They are also an important part of the so-called reconnaissance or fire complex - a concept that aims to shorten the time between target acquisition and firing at the target with a high degree of accuracy, combining all intelligence and fire-specific means. The reconnaissance strike at a operational level or the reconnaissance fire complex at a tactical level is an old idea that originated in the 1980s and 1990s, when a comparable concept could not be realised at the time due to a lack of available modern technology. In terms of exercises, the Tsentr-2019 gave an interesting insight into the use of UAVs. During the exercise, they appeared in swarms in the rear of the enemy and autonomously detected, identified and attacked targets. First, command posts and communication nodes were attacked and then transports or the deployment of

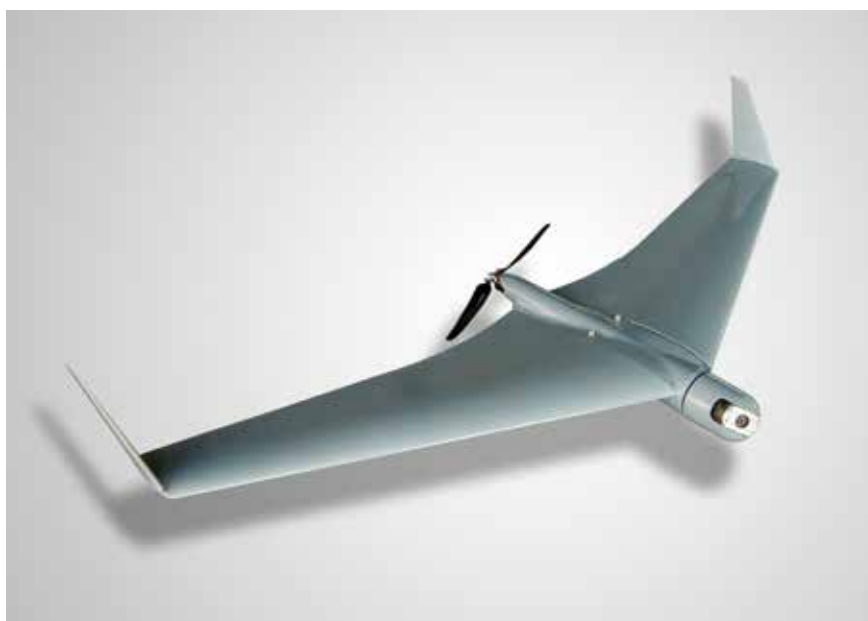


Photo: via author

The NABLUJDATEL UAV

reserves. In addition, enemy air defence installations were also targeted.

UAVs were also used in the conflict in eastern Ukraine and Syria. In Ukraine, with one exception, there were no air operations with UAVs, while all parties involved in the conflict used drones, including those commercially available as well as home-built ones.

An interesting aspect of the deployment of UAVs in eastern Ukraine is what the US military was told by their Ukrainian counterparts: "When they see certain types of UAVs, they know that missiles will land on them in the next 10-15 min-

utes". While the number of existing Russian UAVs is impressive, only a small number are actually in service with the armed forces, all of them small or medium, short or medium range UAVs. The vehicles identified as being in service today are:

UAVs in Service

While the number of existing Russian UAVs is impressive, only a small number are actually in service with the armed forces, all of them small or medium, short or medium range UAVs. The vehicles identified as being in service today are:

Designation	Range / Endurance / Wingspan
ELERON-ESV	25 km, 2 h, 1.47 m
FORPOST/SEARCHER	150–250/400 km, 17.5, 8.55 m
GRANAT-1/GRUSJA	15 km, 1 h 15 min, 82 cm
GRANAT-2	15 km, 1 h, 2 m
GRANAT-3	40 km, 2 h, 2 m
GRANAT-4	up to 100 km, 6 h, 3.2 m
NABLUJDATEL/I-VIEW MK150	100 km, 7 h, 5.7 m
ORLAN-10	500–1000/120 km with ECM-payload.10/16 h, 3.1 m
PHANTOM	unknown, 30 min
TACHION	40 km, 2–6 h, 2 m

utes". By mid-2018, the UAVs in Syria had been in the air for about 140,000 hours and carried out more than 23,000 missions. Syria was also an important test site for Russian military equipment, not least for UAVs, including the ORION, an armed UAV currently under development. Obviously, both Syria and Ukraine have provided the Russian Armed Forces

With the exception of the PHANTOM, a small, commercially available Chinese quadcopter, all of the above-mentioned drones are aircraft designs and propeller-driven. The payload is of an optronic multi-mission type, with ORLAN-10 also figuring with an ECM payload, LEER-3. Whether one of them is also capable of carrying weapons is not known, although it cannot be excluded. One

Photo: via author



The DOZOR-600 UAV at the MAKS Moscow Air Show 2009

Photo: Vitali Kuzmin



The FORPOST, UAV on display at Innovation Day 2013

of the UAVs, FORPOST, has also been updated, and ten systems of the upgraded version, FORPOST-R, will be delivered to the Russian Armed Forces over the next three years.

However, what Russia lacks today are UAVS of the HALE segment, i.e. high-altitude and long-range UAVs. This deficiency has been fully recognised and, as a consequence, there are a number of new UAVS currently under development. The most interesting among them are the ALTIUS-U/ALTAIR, KATRAN, KORSAR, OKHOTNIK and ORION. ALTIUS-U/ALTAIR is a twin-engine propeller-driven vehicle with a service life of 24-48 hours and a range of 10,000 km. The ALTIUS project has been plagued by numerous problems and even economic fraud, which led to a

change of manufacturer. However, the development is now to be completed, and the vehicle is intended for both intelligence and ECM missions. KATRAN is a helicopter drone with a life span of four hours, and flight testing should have been completed in 2019. Whether this was the case and how far development has progressed is not known.

Corsair has a range of 120-160 km, an endurance of 10 hours and should be armed, possibly with an ATGM. According to the Russian media, the flight tests were conducted armed, although the current status of the project is unclear. In 2019, there were problems with the engine. OKHOTNIK, or the S-70, is a heavily armed jet aircraft wing with a weight of 20/25 tonnes and a range of

3,500/5,000 km. It flew for the first time in August 2019 and can carry a payload of 2.5 tonnes. One source claims 7-8 tonnes, consisting of 50-100 kg bombs, which are under development. The ORION drone, whose series production began in 2019 and which was successfully tested in Syria, has a range of 1,200 km and a life span of 24-40 hours. An ORION also crashed spectacularly in November 2019, which was widely reported in the Russian media.

The Future

A look at developments since 2009 in the field of UAVs gives the impression that Russia is in the process of catching up with the West, if this is not already the case. Today, UAVs are a powerful intelligence threat and a threat that becomes even deadlier when armed and swarming. Whether Russian development and the use of UAVs with greater range and endurance will be successful remains to be seen. It also cannot be ruled out that Western sanctions will prove effective and thus cause delays.

However, the development of UAVs must not be viewed in isolation. Instead, they need to be seen in the context of the development of other unmanned vehicles intended for sea and ground use. It cannot be ruled out that, in the future, they may act jointly and autonomously by being equipped with artificial intelligence. What happened during Tsentr-2019 and that the UGV MARKER appeared with a swarm of mini-UAVS points in this direction. This poses a threat that cannot be ignored. How to act on a future battlefield, interspersed with various types of unmanned vehicles, will require some creativity today. ■

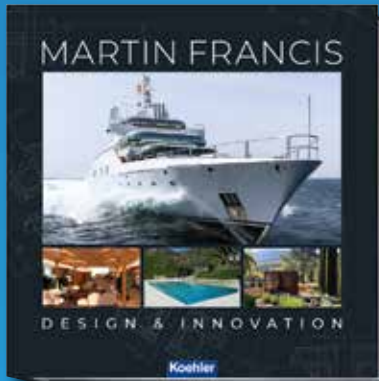
Photo: Bellingcat



In May 2015, a Ukrainian special forces unit of the Dnipro-1 Battalion shot down a US\$6M Russian FORPOST drone near Avdeevka in Eastern Ukraine.

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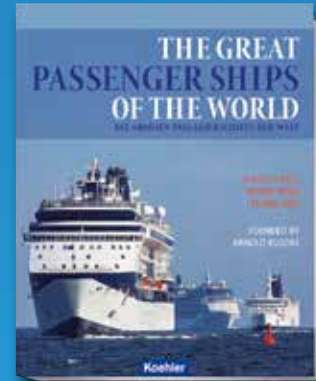
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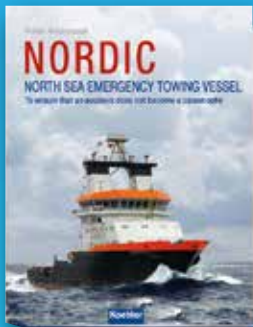
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Viewpoint from Ankara

Yet Another Refugee Crisis

Korhan Özkilinc

The civil war in Syria in the last 10 years has transformed a highly cultured Arab people into a mass of refugees. The situation has deteriorated dramatically in recent months, especially in the cities. Russian bombs make no distinction whether it is a small child or an elderly person; helpless bodies are literally torn to shreds at a daily rhythm. Of the almost 24 million Syrians still alive, 8.5 million live in the Syrian-Russian controlled areas, 3.2 million in Kurdish dominated areas and, lately, almost 9 million Syrians in Turkish controlled areas. The Syrian dictator, Bashar al-Assad, with the help of Russian President Vladimir Putin, is challenging the security of Europe by bombing the civilian population and causing a large wave of refugees heading for the Turkish border. The current state of the Turkish economy and Europe's reluctance inevitably leaves Turkish President Recep Tayyip Erdogan with no choice but to let the masses of people pass through further into Europe.

It is a question of perspective: the Turkish side calls this burden sharing, and the EU sees this as blackmailing by the Turkish government. Meanwhile the human tragedy goes on.

Politically and economically ailing Turkey which to this day provides for more than four million refugees, is no longer in a position to accept any further Syrian refugees. That is why the Turkish army's advance into the northern Syrian towns of Idlib and Afrin is warranted, so as to hold back the masses of people in their own country and, at the same time, to create a buffer zone for 2-4 million refugees, which would allow the refugees in Turkey to resettle at home. Unfortunately, Russian President Vladimir Putin is thwarting Turkey's plans with aggression and destruction. Russia is waging a hybrid war against the democratic order in the Crimea, Libya and also in Syria, using the refugees as weapons. The Western community can no longer pursue global politics without Moscow, let alone solve the conflicts on its own. Russia may have regained its former strength, but at what price? How long can President Putin, with his undemocratic manner, maintain the current situation and the unstable situation in Russia? Yet another trouble spot could once again force millions of people as refugees towards Europe. The US has been trying for years to bring the Iranian clerics to their knees by all means, including economic sanctions, and in doing so it is also accepting the suffering of the Iranian people. For years, the country has been heavily affected by embargoes. In addition, the resentment of the Iranian people against the theological elite has increased greatly. These developments must be taken into account; further unrest would plunge Europe into a major crisis in terms of security policy, as Sunni refugees already living



Photo: via author

A camp for Syrian civil war refugees

in Europe would be confronted with Shiite refugees in the middle of Europe, which would inevitably lead to clashes like the ones we have seen in Beirut, Damascus or Sanaa.

Because of the tense situation on the Turkish-Greek border EU Commission President Ursula von der Leyen travelled to Greece at the beginning of March to show solidarity with Greece and Bulgaria and mobilise emergency aid to the tune of €700M. Unfortunately, the refugee crisis is not a problem that can be solved with money. The human tragedy that has been going on for years requires not only political but also military courage from the EU. Should the EU fail in this, Europe's "strategic autonomy" has no chance of survival. Buzzwords such as commitment or continuous efforts will not help. Turkey is a prime example. The promised EU funds of €6Bn, which are to be paid out in full to Turkey by 2025, are no longer an option for conflict resolution. According to the European Commission's press release of 2 March 2020, €4.7Bn of the total €6Bn were given to aid organisations on the ground in Turkey, so that the EU has paid €800 per refugee living in Turkey. That is ridiculous, because over the years Turkey has paid over US\$30Bn out of its own pocket for the refugees. The EU is perfectly capable of paying an additional billion to Turkey, but the Turkish President is not allowed to triumph. On the other hand, the refugees who come to Europe create racism in the EU population. The refugee crisis should not be seen as a crisis, but rather as a challenge, because it is a test of our fundamental democratic values, which should not create additional potential for conflict. We should therefore stop wasting time and start drawing up a common plan. One thing is clear, however, and that is that Turkey is no longer able to solve the refugee crisis without the EU. The Moscow ceasefire agreement of 5 March 2020 between Turkey and Russia on the city of Idlib hopes for a peaceful outcome, but has shown in the past that an agreement with Russia is illusory. Moreover, Turkish politics should use its diplomatic powers of persuasion more effectively instead of continuing to pour oil on the fire, as this fire has the power to burn everyone

Bridging the Gap – Armoured Combat Bridging

Christopher F. Foss

Combat engineers play a key role on the battlefield and are equipped with a wide range of specialised equipment to carry out this mission, including armoured engineer vehicles (AEV) as well as armoured vehicle launched bridges (AVLB).

Both of these are normally based on a main battle tank (MBT) platform modified for this specialised mission, although there are also some wheeled bridging systems and a few on lighter tracked armoured fighting vehicle (AFV) platforms. One of the trends in recent years is to upgrade the capability of the bridge to take into account the significant increase in the gross vehicle weight of AFVs, especially MBTs, as well as providing the platform with a similar level of cross-country mobility and survivability with the AFVs they are supporting.

In some armies, the AVLB is one part of a complete 'bridging system' and the AVLB is usually supported by a tractor truck (6x6) towing a semi-trailer carrying an additional bridge, which sometimes can be of a different length to allow the AVLB to lay a bridge to meet the specific gap-crossing requirement.

Some contractors, such as Krauss-Maffei Wegmann, also offer a complete training package and most now offer through life support.

While the ideal solution is to procure an AVLB or AEV at the same time as a new MBT, usually these are procured many years afterwards. A good example is Germany, who took delivery of its first production LEOPARD 2 MBTs as far back as 1979 and for many years used the BIBER AVLB based on a LEOPARD 1 MBT platform, which could transport and launch a Military Load Class 60 bridge, which when opened out was 22 m long and could span

Photo: KMW



The KraussMaffei Wegmann LEOPARD 2 platform is being increasingly used as the launch platform for the LEGUAN bridge and is shown here carrying one 26 m bridge.

a gap of up to 20 m. It was not until October 2016 that Germany placed a contract for seven more capable LEOPARD 2 based LEGUAN AVLB with deliveries running from 2021.

Although originally developed for military use, AVLB and other types of military bridging systems also have a valuable role to play in times of natural disasters where existing bridges have been damaged or in some cases swept away, leaving parts of the country cut off.

MBT-based AVLB

In the case of a tracked AVLB based on an MBT platform, the turret is removed and the upper part of the hull modified to transport and launch a bridge over the front of the platform with the crew under full armour protection. While some of these are based on surplus MBT chassis, some end users prefer a brand new platform rather than one that was perhaps built 20 or 30

years before.

Some of these AVLB also have a front-mounted dozer blade used to prepare the bridge-launching area to provide a level surface where the dozer blade is then used to stabilise the system while the bridge is being launched.

The actual bridge can be of the so-called 'scissors type' as used on the older US M48/M60 AVLB, or more commonly the horizontally launched type, which has a reduced visual signature and both bridge types can be launched or retrieved from either end.

The AVLB is sometimes armed with a 7.62mm or 12.7mm machine gun (MG) fitted to a protected weapon station or remote weapon station for self-protection. Most AVLB are today fitted with banks of electrically operated smoke grenade launchers, some are equipped with additional cameras for enhanced situational awareness and a laser rangefinder to measure the gap to be crossed.

Author

Christopher F. Foss has been writing on armoured fighting vehicles and artillery systems since 1970. He has also lectured on these subjects in many countries as well as chairing conferences all over the world. He has also driven over 50 tracked and wheeled AFVs.

Photo: Christopher F. Foss



The Russian MTU-72 can transport and launch a 20 m bridge over the front of the platform and, when travelling, either end of the bridge is folded up on top of the bridge to reduce length.

For many years, the standard AVLB deployed by China has been the Type 84 based on a now obsolete Type 69 series MBT hull which transports and hydraulically launches a two-part scissors bridge over the front of the vehicle that is, when deployed, is 18 m long enabling a gap of 16 m to be crossed and can take tracked vehicles up to 40 tonnes.

More recently, China has been marketing this system based on a more recent Type 79 MBT platform but with a horizontally laid bridge with the same capabilities. While Chinese mobile bridging systems have been marketed by China North Industries Corporation or Poly Technologies but the China Harzone Industry Corporation is now marketing the HZ family of tank-launched

bridges. The two scissor-type bridges are the HZT 26, which is to MLC 70 and the HZT21, which is to MLC 50 while the horizontally deployed HZT 22 is to MLC 70, which takes into account the increased weight of some of the more recently deployed Chinese AFVs. The actual number on the designation relates to the overall length of the deployed bridge.

One of the most widely used AVLB's is the German Krauss-Maffei Wegmann LEGUAN, which is of the horizontal laying type and forms part of the LEGUAN Modular Bridge Solution (MBS), which as well as MBT-based AVLB's also includes pontoon and ferry systems so enabling the end user to deploy a complete bridging system using common bridges. By February 2020, total

sales of the LEGUAN were 221 tracked solutions, 45 wheeled solutions, 410 bridges and seven ferry and floating kits.

In the past, some customers based their LEGUAN bridges on surplus MBT platforms such as M60 (Spain) or LEOPARD 1 (Greece and Turkey). However, an increasing number of customers today use the Krauss-Maffei Wegmann LEOPARD 2 MBT platform, with some customers using refurbished platforms while others preferring brand new platforms and some users have procured LEGUAN on a wheeled platform.

Known customers for LEGUAN, based on a LEOPARD 2 platform, include Denmark, Finland, Germany, Netherlands, Norway, Singapore, Sweden and Switzerland. Denmark ordered the system late in December 2019 with deliveries starting late in 2022.

Standard equipment for the LEOPARD 2 based LEGUAN includes a vehicle-integrated test system and a number of options are being marketed for the platform, including a crew compartment cooling system, an integrated auxiliary power unit, a mine and improvised explosive device (IED) protection system, adequate frontal protection and a mechanical MG mount for the vehicle commander. For enhanced safety, there is a hydraulic-free crew compartment and pressure tight bulkhead between the crew compartment and technical compartment. The LEOPARD 2 LEGUAN AVLB can transport and launch either one 26 m or two 14 m bridges over the front of the hull with a weight limit of MLC 80, but in an emergency the LEGUAN can take tracked vehicles up to MLC 85 and wheeled vehicles up to MLC 100. The 26 m bridge takes six minutes to lay and eight minutes to retrieve while the 14 m bridge takes five minutes to lay and seven minutes to retrieve. In addition to deploying single bridges, a number of LEGUAN bridges can be laid in tandem to cross wider gaps. For example, one 26 m and one 14 m bridge allow a gap of 30 m to be rapidly bridged.

Some countries prefer to develop their own AVLB with a good example being India, which has fitted the locally manufactured Russian T-72M1 hull with a scissors bridge launched over the front of the hull. This bridge was originally developed for the KARTIK AVLB based on a lengthened VI-JAYANTA MBT hull, which was the locally manufactured Vickers Mk 1 MBT.

Elbit (previously Israel Military Industries), built large numbers of AVLB for the Israel Defense Forces based on a M48/M60 MBT platform with the TANDEM bridge having an overall length of 11.7 m and spanning a gap of 11 m with the M48/M60 carrying two of these.

Photo: Leonardo DRS



The US Joint Assault Bridge is based on an upgraded M1A1 ABRAMS MBT platform and launches a scissors bridge over the front.



Photo: CNIM

The French Army deploys the CNIM Modular Assault Bridge, which is based on a 10x10 platform with a protected cab and is shown here launching one of the two 14.3 m bridges carried over the front.

Japan has been self-sufficient in AFV development and production for many years, with the latest AVLB being the Type 91 based on a modified Type 90 MBT, which has a horizontally launched bridge that is 20 m long and can be used to span a gap of up to 18 m.

South Korea has also been self-sufficient in the design, development and production of AFVs for many years based on the Hyundai Rotem K1 MBT hull. Other variants have also been developed, including an AEV, ARV and AVLB. The latter is fitted with a launching system and scissors-type bridge developed by Vickers Defence Systems (now Rheinmetall BAE Systems Land), which when opened is 22 m long and can span a gap of up to 21 m. The Russian Army has always placed great emphasis on its gap-crossing capability and for many years deployed AVLB based on the older MBT platforms, including the MTU-54 (on T-54 platform) and MTU-20 (on the T-55 platform). The latter carries a horizontally laid bridge that, when deployed, is 20 m long and can be used to span gaps of up to 18 m. These were followed by the MTU-72 based on a T-72 platform, which carries an aluminium bridge and, when travelling, either end is folded up through 180 degrees so it rests on top of the bridge thus reducing the overall travelling length. When deployed, the bridge is 20 m long and can be used to span a gap of up to 18 m.

More recently, a new AVLB has been developed in Russia based on the T-90 platform, which has a bridge of a new design with similar gap crossing capabilities to MTU-72 but with the capability to be crossed by heavier vehicles.

While some members of the former Warsaw Pact used the Russian AVLB, the East German Army deployed the BLG-60/BLG-67 series AVLB based on a T-55 platform and this transported and launched a scissor's bridge which, when opened out, was 21.6 m long spanning a gap of up to 20 m. This AVLB was also exported to other countries including Bulgaria, India and Poland.

The former Czechoslovakia also developed a T-55 based scissors bridge which, when deployed, was 20 m long bridging a gap of up to 18 m and this was also exported. Poland built the Russian T-72M1 MBT under licence with further development resulting in the PT-91 (which later evolved into a complete family including an AV-

LB), which is designated the PMC-91M, which is fitted with a German LEGUAN 26 m bridge launched over the front of the vehicle.

Malaysia has taken delivery of a complete MBT package that included 48 PT-91M MBTs, six WZT-91M ARVs, three MID-91M AEVs and five PMC-91M AVLBs.

The UK Army CHIEFTAIN AVLB has been replaced by the TITAN, which was designed and built by the Rheinmetall BAE Systems Land as part of the Engineer Tank System, which also included the TROJAN BREACHER.

Both of these are based on CHALLENGER 2 MBT sub-systems and the two prototypes of the TITAN were built followed by 33 production vehicles and these can transport and launch one Number 10 Bridge or two Number 12 Bridges.

The Number 10 Bridge is of the 'scissors type' and when deployed this is 26 m long and can bridge a gap of 24 m while the Number 12 Bridge is 13.5 m long and typically spans a gap of up to 12 m.

The bridges transported and launched from the TITAN are part of the UK Army's Modular Bridge System (MBS), which is also referred to as BR90 and the other element is based on a Unipower 8x8 platform mentioned later in this article.

For many years, the standard AVLB for the US was based on the obsolete M60 tank platform and launched a scissors bridge over the front of the platform which, when extended, is 19.20 m long and spans a gap of 18.28 m.

The US Army procured 43 WOLVERINE Heavy Assault Bridges (HAB) based on a General Dynamics Land Systems (GDLS) M1 series MBT platform fitted with a Krauss-Maffei Wegmann Leguan 26 m MLC 70

Photo: Christopher F Foss



General Dynamics Land Systems UK ARES armoured personnel carrier used to transport and launch a General Dynamics European Land Systems - Bridge Systems COBRA armoured assault bridge.

bridge launched over the front of the hull. The latest US programme is the Joint Assault Bridge (JAB) based on a modified surplus M1A1 ABRAMS platform with heavy M1A2 suspension fitted with a launching mechanism for the currently deployed MLC 85 scissors bridge over the front of the hull. Following completion, GDLS and Leonardo DRS were each awarded contracts for the Engineering and Manufacturing and Development phase of the JAB and each built two prototype vehicles for trials. Late in 2016, Leonardo DRS was awarded the production contract with Elbit being a sub-contractor together with Anniston Army Depot. The latter will deliver the upgraded M1A1 platforms to DRS Technologies in West Plains, Missouri, where DRWS Technologies will integrate the bridge and launching system and where the scissors bridge will be to the MLC 95 specification.

According to Steve Rienstra, Product Manager for Bridging, US Army Programme Executive Office for Combat Support 7 Combat Service Support "The JAB will be a significant enhancement to the maneuverability of the Army's combat forces, especially the Armored Brigade Combat Teams. It is faster, more survivable and more sustainable than its predecessor." According to the US Army, up to 308 JAB will be procured for the US Army and Marine Corps and will replace the currently fielded M60 and WOLVERINE HAB.

In addition to AVLB, based on a MBT platform there are a number of lighter AVLB, with the now STK Engineering Land Systems BIONIX AVLB being a typical example. The Singapore Armed Forces deploy significant numbers of the locally developed BIONIX infantry fighting vehicle and as well as more specialised versions, including an armoured recovery vehicle (ARV), the TRAILBLAZER flail type mine clearing system and an AVLB. The latter is fitted with a Krauss-Maffei Wegmann two-part MLC 30 bridge that is launched over the front of the vehicle and, when fully extended, is 22 m long and can span a gap of up to 20 m.

Protected Wheeled Bridging Systems

There are a number of wheeled bridging systems but most of these are unprotected and would not normally be deployed in the direct fire zone but would be used as a follow-up to the MBT based AVLBs. France developed an AVLB based on the AMX-30 MBT platform but this was never deployed by the French Army, although some were sold to Saudi Arabia. The French Army today deploys the Con-



Photo: RBS

The Unipower (8x8) platform is used to carry elements of the BR90 system deployed by the UK Army and some have been fitted with a protected forward control cab.

structions Industrielles de la Mediterranee (CNIM) Pont d'Assault Modulaire Modular Assault Bridge. This is based on a 10x10 platform with a protected forward control cab and carries two 14.3 m long bridges, which are carried on top of the other but as an alternative a bridge with an extended length of 26 m can be carried. The French Army has taken delivery of 10 systems since late 2011.

General Dynamics European Land Systems – Bridge Systems (GDELS-BS) Germany have considerable experience in military bridging systems, including the M3 Amphibious Bridging and Ferrying System, Improved Ribbon Bridge and the Rapidly Emplaced Bridge System. The latter is normally transported and launched by an 8x8 AFV platform and can transport and launch a MLC 50 bridge over the front, which is 13.80 m long and can span a gap of up to 13 m.

More recently, GDELS-BS have completed development of their COBRA Armoured Assault Bridge (AAB), which is now ready for production. This has already been demonstrated and installed on a GDELS-MOWAG PIRANHA (8x8) platform, ASCOD tracked chassis and more recently on a GDELS UK ARES armoured personnel carrier now in production for the UK Army. The company is marketing the COBRA AAB as a dedicated and permanent AAB or a temporary AAB onto an existing AFV platform. The dedicated/permanent AAB is equipped with a fully integrated bridge launcher and control system while the temporary launcher is equipped with a temporary Bridge Launching Mechanism and a Jettison Fitting Kit from Pearson Engineering from the UK. A typical GDELS-BS bridge for the AAB would be of aluminium construction and have an overall length of 15 m when deployed, which would enable a gap of up to 14 m to be crossed to MLC50.

Krauss-Maffei Wegmann are also marketing a 12 m MLC 40 AVLB based on a GDLS STRYKER (8x8) platform as used by the US Army but this could also be installed on other 8x8 platforms.

As previously mentioned, the UK Army fields the BR90 MBS with the Close Support Bridges (CSB) being deployed by the TITAN and the General Support Bridge (GSB) transported and launched from a UNIPOWER (8x8) platform with an unprotected forward control cab. For operations in Afghanistan some of these were upgraded, which included the installation of a protected cab. The only export customer for the GSB is Malaysia who fields the system on a Rheinmetall MAN Military Vehicles (8x8) platform and has the 52 m Axially Tensioned Long Span Bridge. Under 'Project Tyro', the UK Defence Equipment & Support organisation) is running a competition to replace both the GSB and CSB with tenders issued late in 2018 and now returned with a MLC 100 requirement mandated. The initial requirement is for 11/13 GSB to bridge a gap of 30 m but with a capability to extend to 60 m and 7 to 13 launch vehicles. The CSB requirement is for 29/49 short bridges with a length of 11.5 m and 19/34 medium bridges with a length of 24.5 m with potential to extend to 60 m. In addition, 14/36 wheeled CSB launch vehicles and 11/17 wheeled support vehicles are required.

In February 2020 the DR&S said that the "Demonstration, manufacture and initial support contracts will be awarded in the last quarter of 2021 with one each for CSB and GSB capability."

Williams Fairey Engineering Limited (WFEL), owned by Krauss-Maffei Wegmann of Germany, have supplied their Dry Support Bridge to a number of export customers, including Australia, Turkey, Switzerland and US on various wheeled platforms and will also bid for this programme. ■



Viewpoint from Athens

Photo: Dimitrios Angelopoulos



Greece Facing Rough Seas

Dimitrios Angelopoulos

Greece faces massive organised border violations and Turkish provocation over the Aegean Sea, while the COVID 19 pandemic is spreading rapidly in the country.

On 28 February Turkey declared that it would no longer try to keep illegal immigrants on its territory, which is why thousands of them tried to cross into Greece. Greek soldiers and riot police have gathered at the Greek-Turkish borders to stop the wave of refugees.

Most of the immigrants come from Afghanistan, Pakistan and sub-Saharan Africa and are trying to cross the border along the river Evros in north-eastern Greece, after Turkey said that it would no longer prevent immigrants trying to reach Europe.

Greek police fired tear gas to force back hundreds of stone-throwing immigrants who tried to cross the border from Turkey. The European Union said it would help Greece - and its neighbour Bulgaria, which also shares a border with Turkey - to protect Europe's borders.

The Greek authorities estimate that thousands of immigrants are also gathering along the Turkish coast opposite the Greek islands, waiting to cross the Aegean. So far, arrivals to the islands have been relatively low due to bad weather conditions.

This recent escalation in the EU's immigrant crisis is a first major test for Greece's conservative New Democracy government since coming to power in July 2019. UNHCR statistics show that since 2014, when the immigration crisis began, over 1.2 million refugees have arrived in Greece. With each new wave, the line between the vulnerable refugees fleeing war and persecution and those who immigrate for economic reasons is becoming increasingly blurred - placing those responsible in a difficult situation who must resolve the problems. In March 2016, the EU and Turkey signed a pact to stem the flow of migrants into Europe in return for billions of euros from the EU to Turkey.

The Heads of State and Government of the European Union visited the Greek border with Turkey to show their solidarity with the country. "This border is not only a Greek border but also a European border. And I stand here today at your side as a Euro-



Photo: Romania Missions

Refugees crossing into Greece

pean," Ursula von der Leyen told Greek Prime Minister Kyriakos Mitsotakis. And German Chancellor Merkel said after a meeting with the Greek Prime Minister: "Greece deserves our full solidarity and support".

As regards the Greek-Turkish dispute, Turkey continues to commit serious violations of international law in the Aegean region. Greek territorial waters are violated almost daily, and there are frequent violations of Greek airspace by Turkish fighters. The Greek Government maintains that Turkey's violations against Greece threaten the territorial integrity of an EU Member State. Since Turkey is already illegally drilling for oil and gas in Cypriot waters and intends to do the same off the island of Crete after the illegal deal with Libya, the Turkish Foreign Ministry is calling for the raw materials to be shared in the areas around the Greek islands. Greek Foreign Minister Nikos Dendias said there will not be "a dishonourable and abusive compromise" with Turkey.

While the COVID 19 pandemic is spreading rapidly across Europe, the Greek government announced a total lockdown of the country as of 23 March morning. All non-essential transport and movement of people will be forbidden, said Greek Prime Minister Kyriakos Mitsotakis in a television address.

Greeks are only allowed to go to work, buy food or medicine, see a doctor, walk with a pet, walk alone or in groups of two. They must carry an identity card and the reason for their movements must be confirmed by their employer or by themselves. There are 743 confirmed cases in Greece and, according to the Greek authorities, so far 20 deaths have been caused by COVID-19.

Masters in Their Own Niche

Austria's Defence and Security Industry

Georg Mader

More than 100 Austrian companies produce and sell in the security and defence sector. The sector and its suppliers directly employ around 9,500 and indirectly 24,000 people, generating an annual turnover of around €2.7Bn. As the Austrian Armed Forces are still underfunded or neglected - regardless of the governing coalitions - the sector achieves an export share of approximately 94%. This puts the sector at the top of the already strong Austrian export industry.

This was not always the case. During the Cold War, defence companies often had problems finding customers for their products because Austria, as a neutral country, was outside NATO or another military alliance. As a result, the underfinanced Austrian Armed Forces was the only customer for defence equipment. However, 'neutrality' also meant that the Austrian Armed Forces had to pay a much higher 'protectionist' price for almost the same goods produced by a company in a member state of a military alliance, putting an additional burden on Austria's low defence budget. The lack of money for the purchase of defence equipment made the Austrian military reluctant to procure. For this reason, the Austrian arms industry declined from the 1980s until the start of the 2000s. It was a few risk-taking niche companies that became global market leaders in their segment. These companies, often referred to as 'hidden champions', have turned the fortunes of the sector around. Today, they offer a wide range of products, services, technologies and knowledge, with system and component know-how in all these areas. In addition, they also offer certified engineering and consulting services as well as test and trial services and facilities. And, according to various experts, they meet the constantly increasing demands on technology. Their respective portfolios can best be attributed to three main areas.

Photo: Georg Mader



The Schiebel CAMCOPTER VTOL UAS is one of Austria's widely successful export products.

Metal Technology

With more than 1,200 companies in mechanical engineering, plant construction, steel and metal goods construction as well as the foundry industry, metallurgy is the industrial backbone of Austria. The export-oriented sector is characterised by medium-sized companies with more than 85% of them are family owned, accounting for a quarter of all Austrian exports. The metallurgical industry employs about 130,000 people and secures about 250,000 jobs. In 2017, it generated a turnover of €37Bn.

Electrical and Electronics Industry

With more than 62,000 employees, a turnover of € 37Bn and an export share of 80%, this is the second largest industrial sector in Austria. With research and development investments of 20,000 euros per employee (approx. 1 billion euros/year), it is the most research-intensive industry in the

country. Austrian IT and communication systems companies have extensive know-how in the field of IT security. Their products are internationally renowned for their reliability and trustworthiness. The 'Fachverband der Elektro-und Elektronikindustrie' represents the industry and is a competent partner when it comes to cyber security.

Automotive Industry

The product portfolio of the approximately 150 members of the Association of the Automotive Industry includes almost all types of vehicles, from bicycles and motorcycles, road and off-road vehicles, commercial vehicles, various trailers to small aircraft. The products also include parts and components such as bodies, engines and transmissions. The Austrian automotive industry is known internationally for its high quality and technological leadership - as evidenced by an export quota of +90%. The automotive industry employs 35,000 people and generated a turnover of €15Bn euros in 2018.

Author

Georg Mader is a defence correspondent and freelance aerospace journalist based in Vienna, Austria, and a regular contributor to ESD.

SCHIEBEL



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RESUPPLY
OPERATIONS
CARGO NET SLING LOAD

CAMCOPTER® S-100
UNMANNED AIR SYSTEM

Photo: Glock



The French Armed Forces have procured 74,596 Glock 17 Gen 5 pistols in tan and black.

The products from Austria mainly come from the following technology areas:

- Automotive and accessories
- Non-jet aerial surveillance platforms (manned/unmanned)
- Weapons and ammunition
- Personal defence equipment
- IT, communications and cyber technology.

However, most companies manufacture so-called 'dual-use' products and are often suppliers for larger military and civil projects or, as the Austrian Federal Economic Chamber proudly states: "Technological leadership, customer orientation, excellent quality and the ability to offer innovative and tailored solutions justify the global competitiveness of Austrian actors in this strategic security sector".

Top in Research and Development

With investments of 3.2% of GDP in research and development - almost two-thirds of which are financed directly by companies - Austria occupies a top position in Europe. Thanks to the national security research programme KIRAS (which covers the dual-use sector) and the cooperation projects it supports, Austria has been pursuing a holistic approach since 2005, with close exchanges between consumers, research centres and companies. KIRAS has so far supported 232 projects with public funds totalling approximately €80M, the results of which have been incorporated into the development of commercialised products and services for the security market. Those Austrian companies and research institutions with national research experience are often welcome partners in projects of the European Security

Research Programme. While Austria is still in the early stages of its activities for a national defence research programme, close cooperation with KIRAS could lead to initial projects.

Regulation

When it comes to regulating day-to-day business, however, Austrian sales managers too often feel tied down by the War Material Export Act, one of the strictest export laws for military goods worldwide. According to Gerhard Unterganschnigg, who took over the traditional small arms manufacturer 'Steyr-Mannlicher' or 'Steyr Arms', he has already missed out on good business several times through no fault of his own. Austrian laws would hinder domestic companies, putting them at a disadvantage compared to European competitors and ultimately endangering the location, he said. The 50-year-old co-owner is by no means the only one to offer criticism. For smaller and often family-run manufacturers, the worst case scenario, he said, would be that they would receive a revocation of the export license while the goods in question were already in production or ready for shipment. And the industry's successes and positive developments are rarely discussed. Perhaps this is due to the 'Norikum scandal' of the 1980s, when the outstanding GHN-45 long-range artillery guns, produced by Noricum, were sold undercover to both sides in the Iran-Iraq conflict.

A One Stop Shop

As a specialised lobby, the Working Group on Security and Industry (ASW) promotes the interests of the Austrian defence in-

dustry. Together with its members - the Austrian Federal Economic Chamber, the Austrian associations of the metal, automotive, electrical and electronics industries as well as the Federal Foreign Trade Commission - the ASW operates a strong network that reaches all Austrian companies in the security and defence sector. In cooperation with 'Advantage Austria' (the country's foreign trade promotion agency), ASW supports potential partners, customers and suppliers.

The aim of ASW is to act as a 'one-stop shop' for domestic manufacturers and suppliers in the defence sector by bringing Austrian competences to national and international attention.

ASW offers its numerous services free of charge by identifying opportunities for cooperation, facilitating the exchange of information between customers and potential partners, establishing contacts between business partners, supporting the production of general information material, providing an information and service hub at major international trade fairs and exhibitions and organizing special events and workshops.

A Combined Presence

One example of an ASW-supported cluster of Austrian manufacturers was the combined exhibit of eight companies (Achleitner-Fahrzeugbau, Commend International, Glock, Lenzing, Steyr-Arms, T3K-Forensics and Vexcel) at the international trade fair for defence and security FEINDEF 2019 in Madrid.

An updated version of the Steyr-Arms G36 assault rifle used by the Spanish Army was presented at the fair, improving the system without increasing the weight significantly. Austrian know-how was also in demand in the areas of special vehicle construction, protective equipment, weapons and ammunition, tactical communication technology, ar-

Photo: Bundesheer



The Pandur-EVO is manufactured by GDELS in Austria.

tificial intelligence in mobile forensics and mobile air and land based sensor platforms.

Licences

Austria's figures for the export of know-how and production rights through the sale of licenses producers are even more impressive than its hardware exports. A good example is the licensed production of the renowned Steyr AUG assault rifle by SME Ordnance in Malaysia since 1991, with joint production with Steyr starting in 2004. The same rifles were also produced under licence by THALES Australia. In some years, the proceeds from license sales far exceed the proceeds from arms exports. In 2017 alone, figures are estimated at nearly €4Bn. This is almost a 20-fold increase since the first corresponding report back in 1998. The total volume since then: €22.6Bn.

Goodbye to the Giants

Since imperial times, Hirtenberger was one of the defence giants. In recent years, it has not been quite so big. In October 2019, it announced the sale of its Hirtenberger defence division to the Hungarian state 'HDT-Defence Industrial' (HDT Védelmi Ipari Kft) for an undisclosed price. For many years, the division has been calling itself 'The Mortar Company' and has been focussing on 60, 81 and 120mm mortars. Its 85 employees account for €30M or 10% of the group's total turnover. According to the Hungarian Defence Industry Commissioner, Gáspár Maróth, the change of ownership will have no impact on the location, the defence division's brands,



Photo: RAAF

The RAAF's new DA-40NG training aircraft has been designed and produced by the Austrian company Diamond Aircraft Industries.

management or employees. He said: "It is important for us to maintain and expand Hirtenberger's business, technology and excellent customer relationships. And the old and new director of Hirtenberger Defence, Carsten Barth, commented: "I am very satisfied with HDT Védelmi Ipari Kft. This investor will enable us to further expand our business, to push ahead with our important Research and Development programmes and to take advantage of the opportunities of the growing global defence industry".

Recent Developments

The tender for the new French self-loading pistol PANG (Pistolet Automatique de Nouvelle Génération), which was launched in 2019, has been awarded to the Austrian

leader Glock. The selected Glock 17 Gen 5, with a tan handle and black lock, will replace the MAC50 and PAMAS G1, a licensed production of the Beretta 92F, which will remain in service until 2022. The French DGA has reportedly purchased a total of 74,596 pistols (as well as holsters), 7,000 silencer kits, 15,000 laser light modules and 9,000 training weapons. The calibre of the weapon is the proven 9mm x 19 cartridges and the Czech company Sellier & Bellot was selected as the ammunition manufacturer for 45 million full metal jacket cartridges, two million cartridges of subsonic ammunition, four million cartridges of marking ammunition and other accessories. The PANG project has a total value of €44M.

The most recent success of the Austrian Goldeck Textil GmbH is also related to the Czech Republic, namely the supply of special camouflage clothing to the Czech Armed Forces. Deputy Defence Minister Filip Riha signed an agreement for the supply of 39,276 green-printed ECWS-2010 uniforms for training and operations in the Czech Republic and up to 3,535 sand print kits for foreign operations in desert areas. The value was estimated at 15.4 million euros.

In October 2019, Frequentis, one of the world's leading companies for air traffic control equipment, Frequentis, based in Vienna, received an order from the US Department of Defence for four virtual air traffic control towers, including two relocatable systems that could be used at expeditionary airfields. The company's deployable towers will enable air traffic controllers to direct air traffic with a series of visual HD infrared and pan-tilt-zoom cameras mounted on a 15-metre long extendable scissor lift. The system, including a virtual window of five flat screens, can be transported in two shipping containers by



Photo: LtnZCom

In November 2019, the Austrian vehicle manufacturer EMPL delivered four ZETROS 3643 tractors with trailers to the Lithuanian Army to haul PzH 2000 155mm howitzers.



Photo: Georg Mader

The Aerospace Cluster Wiener Neustadt

Three important Austrian manufacturers and developers are located at one site - Wiener Neustadt, which has a long aviation tradition. In 1909, Austria's first airfield was built here and Emperor Franz Josef attended the first air show in 1910. In 1915, the first Österreichische Flugzeugfabrik AG began production for the Austrian Air Corps. And, during World War Two, the largest German assembly plant for the Bf-109 fighter was located here, which is why the district was bombed 29 times from 1943 onwards. As a result, in 1945 only 18 of 4,000 buildings throughout Wiener Neustadt remained intact.

Today, the Wiener Neustadt 'Technopool' has regained an international reputation for aerospace expertise. Innovation drivers such as DIAMOND Aircraft, SCHIEBEL Elektronik or AIRBORNE TECHNOLOGIES have made the place an internationally recognized centre with growth potential. When it comes to the latest innovations for mini-satellites, highly qualified specialists, new materials and ISR components, intelligent aircraft or autonomous flying helicopters, the ESA and NASA rely on the experts from Wiener Neustadt, with more than 1,000 jobs in research and development.

Due to the hesitant mood in Austria with regard to defence exports, figures are difficult to obtain. At the end of 2018, SCHIEBEL, the pioneer of rotating UAVs, announced that its CAMCOPTER S-100 VTOL-UAS had been sold more than 300 times to customers in 16 countries. The company has more than doubled its production area and hired 80 new employees. Schiebel is currently producing an unknown number of CAMCOPTERS for the Royal Thai Navy (RTN). The UAVs are used on the RTN frigate fleet to conduct land and sea-based ISR operations. In addition, the French procurement agency DGA announced that the CAMCOPTER is now operational with the French Navy's amphibious helicopter carrier DIXMUDE of the MISTRAL class, which is the first time that a rotorcraft UAS is being integrated into the defence system of an amphibious helicopter carrier.

In addition to its twin-engine MPP and MSA platforms (of which it has sold ~110 aircraft worldwide), the Austrian DIAMOND Aircraft Industries has installed and integrated more than 60 special mission systems in 10 different foreign platforms, among others for the Italian Air Force, Guardia di Finanza and Coast Guard as

RMMV has been awarded a major order by the Australian Defence Forces for 2,500 protected and unprotected logistics vehicles.

a Lockheed Martin C-130 transport aircraft. Deployable remote virtual towers could help US military services quickly establish expeditionary airfields during a conflict. As part of the DoD contract, two systems will be delivered to the USAF, one fixed and one mobile. Both will be installed at the Homestead Air Reserve Base in Florida. The US Navy will receive a fixed system at Corpus Christi Naval Air Station in Texas, and the US Marine Corps is expected to receive its deployable system at Camp Lejeune in North Carolina. With this DoD contract, Frequentis is making the deployable remote tower product available to US allies, including Japan, South Korea, NATO countries and Latin American states. In November 2019, the Austrian vehicle manufacturer EMPL delivered four ZETROS 3643 tractors (with trailers) to the Lithuanian army. These tractors will be used to carry the 155mm howitzers of the 'General Romualdas Giedraitis Artillery Battalion' of the Lithuanian Army's Mechanized Infantry Brigade 'Iron Wolf'. They also serve in the recently established Logistics Battalion. The 155mm howitzer tractor (with trailer) is a cargo vehicle for transporting German-made PzH 2000 howitzers, Bergepanzer-2 engineer tanks and other heavy and oversized military equipment. The truck has an exceptionally high payload capacity of up to 65 tonnes. Military trucks are also the successful business for global player Rheinmetall MAN Military Vehicles Austria (RMMV/Ö). The Vienna-based truck manufacturer has won a further order from the German Armed Forces for the delivery of another 1,000 logistics vehicles worth €382M. The order is the third batch from a contract concluded in July 2017 for 2,271 HX trucks. The trucks will be built in Vienna and are scheduled for delivery in 2020. Of the 1,000 trucks, 675 have a payload of 5 tonnes, while the remaining 325 will have a payload of 15 tonnes. Another major order was placed by the Australian Defence Forces, which procured around 2,500 protected and unprotected logistics vehicles for €1.1Bn under the 'Land 121 3B' contract. A further 1,000 trucks were added in 2018 for €430M. RMMV has also been awarded a contract by the Swedish Armed Forces to supply vehicles for the transport

of their new air defence system PATRIOT. The 40 HX series trucks comprise 16 tractor units and 24 transport vehicles. The Austrian Armed Forces have also bought a few dozen vehicles.

The PANDUR APC has been built at the Vienna-Simmering plant of General Dynamics European Land Systems (GDELS) since 1996. The PANDUR-I is used in different versions by the Austrian Army, the Belgian Army (as a reconnaissance and ambulance vehicle), the Kuwaiti National Guard (partly armed with 25 mm autocannons or 90 mm Cockerill medium calibre cannons), the Slovenian Army (locally known as VALUK) and the special units of the US Army. 20 out of 70 vehicles of the original US order and 40 vehicles of the second order were manufactured in Austria. The others were assembled in the US by AV Technology. There was no follow-up order for the PANDUR-I. The 8x8 PANDUR-II is not manufactured in Austria, but in the Czech Republic and Portugal. The new PANDUR EVO (Evolution) was, therefore, essential for the preservation of jobs in Simmering. An order for €105M for the Austrian Army in December 2016 enabled GDELS Steyr to increase the number of employees by about 10%. The EVO is a new development and not an upgrade of the older vehicle. It is not known why the Austrian Armed Forces did not choose the PANDUR-II, which is superior to the PANDUR-I.

Allegedly, the EVO shares many common components with the PANDUR-I and is equipped with a remote-controlled 12.7 mm Weapon Station (RWS). The current older PANDUR A2 APCs are armed with a WS4 PANTHER RWS from ESL Advanced Information Technology GmbH, a subsidiary of ELBIT Systems. This RWS can be equipped with either a single 7.62mm machine gun (MG), a single 12.7mm MG or a 40mm automatic grenade launcher (AGL), but since there is no AGL in the inventory, the Austrian Army uses only the M2 Browning MG on the EVO. The first vehicles were handed over in January 2019 with deliveries will be completed by 2020.

well as the Australian Customs, with the aim of improving border surveillance. DIAMOND and the Italian giant LEONARDO have jointly produced a new twin-engined DA62 MAS Maritime Surveillance Aircraft for short and medium-term sea and coastal surveillance missions. The Italian contribution to this cost-effective MPA is its ISR sensor suite, consisting of LEONARDO's GABBIANO Ultra-Light TS-80 (80W) radar, selected by 14 international customers and installed on a variety of platforms, and a third party EO/IR system integrated with Leonardo's Airborne Tactical Observation and Surveillance mission system. In Paris, DIAMOND's latest turboprop trainer DART 550 was also on display with an additional fuel tank and, shown for the first time, a Leonardo Seaspray 5000E Active Electronically Scanned Array multi-mode surveillance radar.

On March 25, 2019, it was also officially announced that the Royal Australian Air Force will purchase eight new Diamond DA40NG aircraft for training. The DA40NG features the latest avionics technology, giving student pilots the opportunity to learn on an aerodynamically advanced aircraft with advanced navigation and flight control systems. Over the next decade, these aircraft will become the standard flight training air-



Photo: STM

The renowned Steyr AUG assault rifle has been licence-produced in Malaysia since 1991.

craft for young pilots, based at RAAF Base Amberley in South Queensland, RAAF Base Richmond in New South Wales and RAAF Base Point Cook in Victoria. The Australian Department of Defence has signed a

10-year contract with Airflite Pty Ltd to provide maintenance services. Airflite has been the main maintenance supplier for the Royal Australian Air Force PC-9/A aircraft for 30 years. ■

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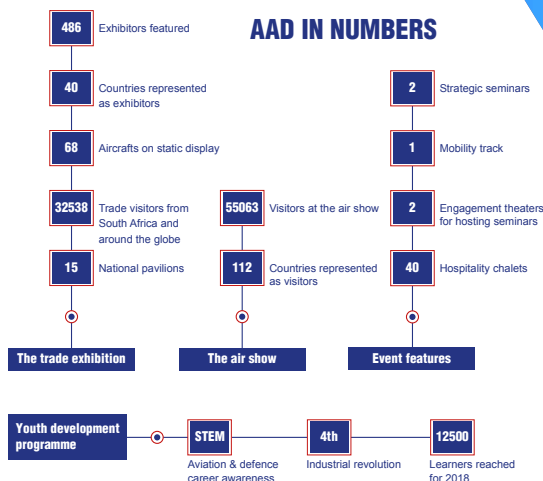


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Addition to AAR's Board



Photo: AAR

AAR, a provider of aviation services to commercial and government operators, has elected John Gilbertson, Jr., retired Managing Director of Goldman Sachs, to the Company's Board of Directors, effective immediately.

The addition of Mr. Gilbertson increases the size of the Board from 11 to 12 directors. Mr. Gilbertson, 63, served as a strategic and financial advisor to clients of Goldman Sachs for 27 years as a Managing Director and as Partner-in-Charge of investment banking services for the Midwest Region. Before joining the firm in 1987, he held roles at Morgan Stanley, Bain & Company and Chase Manhattan Bank. He serves on the Board of Directors of Dover Corporation, a publicly traded company, and Meijer Inc., a privately held company.

New CEO at Aeronautics



Photo: Aeronautics

(ck) Aeronautics Group, a developer and manufacturer of unmanned systems platforms, payloads and communications for defence, HLS and civil applications, has appointed Moshe Elazar as

its new CEO. Elazar will be responsible for Aeronautics' growth strategy. Prior to this appointment Elazar held several executive positions at Rafael Advanced Defense Systems, the most recent being Executive Vice President & General Manager Land & Naval Division. Prior to Rafael, Elazar held numerous senior positions in both Israel Ministry of Defense (IMOD) and Israel Defense Forces (IDF) Navy. Elazar is a retired captain from the Israel Navy. He holds a MA in National Security as well as an MBA and an MSc in Electrical Engineering.

Farnborough Air Show Cancelled



Photo: Farnborough

(ck) Farnborough Airshow – the year's largest aerospace expo and a showcase for billions of dollars in business deals – is the latest major event cancelled because of the coronavirus crisis. Promoters also cancelled the world's largest military air show, Britain's Royal In-

ternational Air Tattoo (RIAT), in July. The back-to-back airshows draw tens of thousands of visitors including military top brass, plane makers and suppliers from around the world to network and do business. The cancellations, following the scrapping of Berlin and Geneva shows scheduled for May, are more evidence of the severity of the crisis as virus-related travel bans seize airline balance sheets and divert the attention of participating governments. Held on alternate years, Farnborough and the Paris Airshow are barometers for the US\$800Bn aerospace industry, which was looking to a soft landing after a decade of growth driven by record jet demand and robust defence spending. Executives say it could take months or even until 2021 for aircraft manufacturers to book significant new orders.

Aitech Names New General Manager for North America



Photo: Aitech

Aitech has named Pratish Shah as general manager for its North American business unit. In addition to leading the North American business unit, Shah will assist in developing and implementing the

company's global growth initiatives as well as managing technology offerings. Shah has led several technology companies through business transformations. Most recently, he served as general manager of Zen Technologies USA, where he developed global opportunities in the US and the Middle East. As president and CEO of Quantum 3D, he helped relaunch the company's technologies to bring virtual, augmented and mixed reality training and simulation to military and defence companies. Shah holds an MBA from Pepperdine University and a BS in Computer Science from Rensselaer Polytechnic Institute.

Former Czech Minister of Defence is CEO of the EDA



Photo: EDA

(huw) On 5 March 2020, the Steering Committee of the European Defence Agency (EDA) appointed the former Czech Defence Minister Jiří Šedivý as the new Manag-

ing Director of the Agency. He will assume the position in April 2020. The former Czech Minister of Defence (2006-2007) and later Deputy Minister of Defence (between 2010 and 2012) was NATO's Deputy Secretary General for Defence Policy and Planning from 2007 to 2010. He returned to Brussels in 2012 as permanent representative of the Czech Republic to NATO (until 2019). On 1 September 2019, he took the position of Special Representative for Resilience and New Threats at the Czech Ministry of Foreign Affairs. Šedivý has a doctorate in political science and a master's degree from London's Kings College. He was Professor of Security Studies at the George C. Marshall European Centre for Security Studies (from 2004 to 2006) in Prague. Prior to this, from 1999 to 2004, he was Director of the Institute for International Relations in Prague, and at the same time Assistant Professor of International Relations at Charles University and Professor of European Security at New York University, Prague. As an expert, he played an important role in the Czech Republic's accession to NATO. During this time, he also served as an external adviser to President Václav Havel. The previous CEO, Jorge Domecq, retired - after an extension of his mandate - as planned on 1 February 2020. He had been in office since 1 February 2015.

Corey Gersten to Join CORAS at US DOD



Photo: US DoD

(ck) In 2009, the US Department of Defense initiated the Contingency Operations Reporting and Analysis Service (CORAS), an automated system and database through which DOD intended

to provide more transparent, accurate, and timely reporting on costs. CORAS provides a frictionless platform to military departments and agencies. It tackles major programming and asset management challenges by aggregating existing data sources, analysing project/programme readiness and automating information reporting. Very recently, Corey Gersten, as Vice President for Department of Defense Sales, has joined CORAS. As a retired colonel in the US Air Force, Gersten is a known force at the Pentagon. Gersten is a former Senior Adviser with lobbyists The Roosevelt Group in National Security Policy

and Strategic Planning. Prior to The Roosevelt Group, Gersten served the Air Force for 26 years, retiring as a colonel in 2013. She has worked all over the world with the Air Force including leading combat units in Afghanistan. Gersten has also held positions as a legislative liaison and communications person, and as Defense Advanced Research Agency (DARPA) fellow. She holds a Bachelor of Science degree from the US Air Force Academy; an MA in History and International Relations from the California State University, and MS in National Security Strategy from the National War College, National Defense University.

New Vice President of Sales at Percepto



Photo: Percepto (ck) Percepto, a developer for industrial drone solutions, has appointed Amit Musli to the role of Vice President of Sales. Amit Musli will build on the success Percepto has achieved in the

past 12 months, during which time the company has grown its customer-base across four continents and 10 countries, providing aerial insights for companies in the mining, oil and gas, solar and thermoelectric power industries. The company has also established a solid foundation expansion in 2020, having helped many customers to obtain waivers to fly its drones Beyond Visual Line of Sight (BVLoS) in the US, Mexico, Singapore, Portugal, Israel and Italy. Amit is responsible for managing Percepto's global sales team. He joins the company from Kramer Electronics Ltd, where, as a member of the management team, he led its corporate sales operations policy and implementation, establishing and managing global sales teams of more than 100 people and generating hundreds of millions of dollars in sales.

RAFAEL Appoints New Head of R&D and Engineering Division



Photo: Rafael (ck) Rafael has appointed Dr Zach Glikman as head of its R&D and Engineering division. Glikman is replacing Dr Ran Gozali who has recently been appointed as head of the

company's Land and Naval Systems division. Glikman (52 years old) holds BSc, MSc and PhD degrees in mechanical engineering from Israel's Technion. He joined Rafael in 1996 and has served in a variety of senior managerial and technological roles. In the last 5 years he has served as head of Rafael's Ordnance Division. Rafael's R&D and Engineering division is made up of some 3,000 engineers, researchers and scientists from a variety of disciplines, including computer software, image processing, mechanics, electronics, aeronautics and more.

Strong Defence but Weak Automotive Sector



Photo: Rheinmetall (ck) The technology group Rheinmetall AG once again recorded growth in both sales and income in fiscal 2019. This is primarily due to the positive business performance of the Defence sec-

tor, but Automotive showed robust performance in a weak market environment with overall declining passenger car production. In FY 2019, Rheinmetall Group has consolidated its sales by 1.7% to €6,255M. Consolidated earnings increased to new record of €505M. The order backlog rose to nearly €11Bn. According to Rheinmetall CEO Armin Papperger, given the uncertainty about the trend in global production over the next few months, which is currently declining due to the global economic risks from the spread of corona viruses, the Rheinmetall Group is subject to heightened forecasting uncertainty regarding the sales and earnings trend."

WFEL appoints new Director for Boxer MIV Programme

(ck) As part of its recruitment campaign for a number of positions created as part of the



Photo: WFEL

BOXER vehicle programme for the British MoD, WFEL has appointed Andrew Munt as BOXER Programme Director, as the company is involved in the production of the BOXER IFV for the British Army. Munt will be responsible for the construction of WFEL's new BOXER facility and the commissioning of the equipment, while ensuring technology transfer from WFEL's parent company KMW. His previous experience includes senior roles in development and production around the world, working on defence and automotive projects for companies such as GKN and BAE Systems. Munt was also involved a few years ago in the original Multi Role Armoured Vehicle programme of the UK MoD – later renamed BOXER MIV. Munt is a graduate engineer, has a degree in metallurgy and is a Fellow of the Institute of Materials, Minerals and Mining.

Rheinmetall Ammunition for F-35

(ck) In an Australian first, Rheinmetall NIOA Munitions (RNM) is set to produce ammu-



Photo: Rheinmetall

nition for the US F-35 Joint Strike Fighter programme. RNM will begin production of 25mm Frangible Armoured Piercing (FAP) projectiles at the federal government-owned Benalla plant in Victoria. The deal marks the first expansion of the RNM joint venture beyond its AU\$60M artillery shell forging plant in Maryborough, Queensland. Rheinmetall Waffe Munitions is a global multinational weapons manufacturer, while Australian-owned NIOA is the leading supplier of weapons and munitions to the Australian Defence Force. The new Load Assemble Pack (LAP) line at Benalla will be capable of producing 20mm to 35mm medium-calibre ammunition. Rheinmetall Waffe Munitions aims to serve as a secondary source supplier to the US government for the F-35 Joint Strike Fighter programme. The Benalla production line is scheduled to be installed in the first half of 2021 and be at full production by September that year.

Schiebel Enhances Production Capabilities with Metal 3-D Printer

Schiebel further enhances the company's production capabilities by investing in a state-of-the-art EOS M 400-4 metal 3D printer for addi-

Photo: ESD archives



tive manufacturing. The company continuously develops its CAMCOPTER® S-100 Unmanned Air System (UAS) by integrating the latest technologies and further improving its production capabilities. Schiebel's new 3D printer is being utilised to produce complex titanium components of the S-100 even more effectively, increasing design freedom and enabling valuable weight savings. The 3D printer is operated at Schiebel's flagship production facility in Wiener Neustadt, Austria. The facility is currently being doubled in size to meet the growing demand for Schiebel's CAMCOPTER® S-100 UAS and is set to be completed mid-2020.

GA-ASI to Host BLUE MAGIC BELGIUM again in 2020

General Atomics Aeronautical Systems, Inc. (GA ASI), a leading manufacturer of Remotely Piloted Aircraft (RPA), announced that it will host BLUE MAGIC BELGIUM (BMB) again this year. Initiated in 2019, BMB is a GA-ASI industrial collaboration event held to identify Belgian technology companies interested in supporting the development of the MQ-9B SKY GUARDIAN RPA. This year's BMB event will be held on 23 and 24 September, 2020 at DronePort's facilities in Sint-Truiden, Belgium. The Government of Belgium has approved Belgian Defence to negotiate for the acquisition of MQ-9B to meet the nation's RPA requirements. "GA-ASI's commitment to providing the best available RPA technology to Belgian Defence means identifying and establishing relationships with companies across Belgium that can assist us with that effort," said Linden Blue, CEO, GA-ASI. "Our inaugural BMB event last year introduced us to 19 great companies. Four of those companies are now part of Team SKY GUARDIAN." The BMB event strives to increase the number of small and medium-sized Belgian companies that can provide research and development (R&D) and innovation to support GA-ASI. GA-ASI hopes to partner



Photo: GA-ASI

and potentially invest in Belgian companies with aerospace and defence technology capabilities that can provide support in these areas:

- State-of-the-art innovative manufacturing developments related to Medium Altitude Long Endurance (MALE) unmanned airframe and aircraft systems;
- Sensor data processing, automation, utilisation & distribution technology developments;
- Air space integration technologies and related developments to MALE unmanned aircraft systems

Companies wishing to meet with GA-ASI representatives during the 23-24 September event should visit <http://theomxevents.com/BlueMagicBelgium> for additional information and event registration.

As part of last year's BMB, AeroSimulators Group (ASG), AIROBOT, ALX Systems and Hexagon joined Team SkyGuardian, which already included these five Belgium companies: SABCA, Thales Belgium, ScioTeq, ST Engineering and DronePort.

Exhibition Update – April 2020

As at 30 March 2020, of those that are relevant to the ESD 2020 schedule, to the best of our knowledge, the following exhibitions have been affected by the COVID-19 coronavirus:

FIDAE	Cancelled
AFCEA Bad Godesberg	Next event 24-25 Feb 2021
DSA	Postponed to 24-27 Aug 2020
Quad A	Cancelled
EuroAsia	Postponed to 24-28 Jun 2020
IT2EC	Postponed to 1-3 Sep 2020
Security Birmingham	Postponed to 22-23 Sep 2020
Xponential	Postponed to 10-12 Aug 2020 (TBC)
SOFIC	Cancelled
IDEB	NO CHANGE (as at 29 Mar 2020)
ILA Berlin	Cancelled
CTX	Postponed to 8-10 Sep 2020
BSDA	Postponed to 14-16 Oct 2020
NITEC	Postponed to Spring 2021
UDT	Postponed to 8-10 December
CANSEC	NO CHANGE (as at 12 Mar 2020)

HEMUS	Postponed to 30 Sep-3 Oct 2020
KADEX	Postponed to 10-13 Jun 2021
SEDEC	Postponed to 15-17 Sep 2020
EUROSATORY	Cancelled
EW Europe	Postponed to 16-18 Nov 2020
ADM Seville	NO CHANGE (as at 29 Mar 2020)
DEFEA	Postponed to 11-13 May 2021
Balt Military Expo	NO CHANGE (as at 29 Mar 2020)
Close Combat Shrivenham	NO CHANGE (as at 29 Mar 2020)
Farnborough International Air Show	Cancelled
SMDC	NO CHANGE (as at 29 Mar 2020)

Notes:

This list covers relevant events originally scheduled before 15 August 2020. ExCeL London is, for the foreseeable future, the Florence Nightingale Hospital

11TH INTERNATIONAL DEFENCE EXHIBITION AND SEMINAR



IDEAS 2020 PAKISTAN ARMS FOR PEACE 24 - 27 November 2020 Karachi Expo Centre



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