

# European & Defence Security

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*International Security and Defence Journal*



## The British Defence Ecosystem

- NATO's Black Sea Strategy
- Italy's Defence Budget Plan
- Poland's Military Modernisation
- German Naval Programmes
- Lithuania's Security Challenges
- Defence Procurement in Serbia
- European Submarine Requirements
- Armoured Military Trucks
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# Iran – a Problem Country



When last year the USA pulled out of the Joint Comprehensive Plan of Action (JCPOA) – the agreement reached with Iran in 2015 about suspending the Iranian nuclear programme – there was a great deal of upset and anger among the Europeans. The continent's leading media were quick to trumpet, no doubt confident that their governments would follow suit, that the Trump administration had yet again pulled its bull-in-a-china-shop act and endangered a cornerstone of global peace, wrung from Teheran through long and delicate negotiations, maliciously and, in the final analysis, not even in the interests of the USA.

Not only did the European signatories to the JCPOA, the United Kingdom, France, and Germany, declare that they wanted to stick to the agreement, they also displayed remarkable meticulousness in circumventing the sanctions pending from Washington, and coming up with creative ideas for developing substitute money transfer procedures with Iran. Unfortunately, they did the sums without taking into account their countries' economies, the interests of which they actually wanted to protect. Faced with the choice of keeping their lucrative US business or trying to crack the hard nut of business development with the Mullahs' regime, the Europeans, almost without exception, opted to bow to the Americans' wishes, and broke off business relations with Iran.

The gratitude which Teheran owed to the governments in Paris, Berlin, and London for the stand taken against the hardliners in Washington was short lived. Since the beginning of July 2019 the International Atomic Energy Agency (IAEA) has confirmed that Iran is again enriching Uranium on a larger scale than would have been permitted under the JCPOA. The permitted maximum quantity held of enriched material has also been exceeded. As well as all this, Teheran has been threatening to put a decommissioned heavy-water reactor back into operation. So now Europe is also being forced, albeit ruefully, to come to the view that the present agreement is beyond recovery and that a new one has to be negotiated. The prevailing European antipathy towards the Trump administration, fed by the American opposition through a constant stream of campaigns, is now so great that the issue of having to acknowledge the US as being in the right is actually no longer an issue. It almost looks as if in this case (and not only in this case) the Europeans regard the USA, not Iran, as being the real problem country. But this in turn means that they accept being exploited by one of the most dangerous regimes of our time as nothing more than pieces on a chess board.

Moreover, even someone who takes the view that international politics that are bound by rules are not only desirable but also possible must accept that now and then there are treaties and agreements (as in the case of the INF Treaty) for which time runs out, or which perhaps should never have been concluded at all. There are a good many people who count the JCPOA among the latter. No sooner was the ink dry on the signature of the lowest common denominator among the negotiating partners than the critics began to make themselves heard, and not just in the USA. Israel in particular, as a state which is threatened with extermination by the regime of the Mullahs, and even Saudi Arabia, which is challenged by Teheran on the geostrategic level in the Gulf region, made no secret of their dismay and anger. The critics take the line that Iran is simply playing for time: its nuclear programme would simply be put on hold to allow the economy to recover after suspension of the sanctions imposed on the country, and once that aim had been achieved, Iran would have the resources at its disposal rapidly to become a nuclear power. And the speed with which the regime has resumed production over the past few weeks shows that this is not simply scaremongering.

A good number of people never tire of pointing out that for decades Iran has not launched a single act of military aggression against other states. Rather, it was itself attacked by Iraq under Saddam Hussein. This may be true, but it is not the whole truth. Below the level of what according to traditional international law is defined as "war", Iran has most definitely set about causing unrest by force throughout the entire region, by supporting proxies such as Hezbollah in Lebanon (and in Syria), the Houthi rebels in Yemen, or the Shiite parties and militias in Iraq, and with more than just words. What drives the regime in Teheran in this context is less an interest in power politics, and far more a focus on religion and ideology. As long as this remains the case, Iran's rulers should not expect anyone to show them any trust.

**Peter Bossdorf**

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# U.S. PRESENCE AT MSPO 2019 WILL AMPLIFY STRONG AND GROWING BILATERAL PARTNERSHIP WITH POLAND

Designation of the United States as the event's "Lead Nation" affirms one of the most stable NATO alliances



*Raytheon Patriot Missile System*



*Lockheed Martin F35-A Fighter Aircraft*



*Lockheed Martin HIMARS Artillery Rocket Systems*

U.S. defense and security companies looking to enter European markets or expand business there have set their sights on the next edition of MSPO, September 3-6, 2019 in Kielce, Poland, to strengthen partnerships with buyers and influencers in this strategically critical region.

The annual event, Europe's third largest and most diversified aerospace industry gathering, has designated the United States as its "Lead Nation," ensuring extra interest and attention to U.S. equipment, products and services.

The distinction "reflects longstanding and strong military cooperation between Poland and the United States as well as increased U.S. commitment to Poland's and the region's security," said a spokesperson for the U.S. embassy in Warsaw.

Both countries have prioritized developing and acquiring state-of-the-art technology and equipment, and have collaborated in the field to deter aggression in Europe and around the world.

"Poland's security is Europe's security, and by extension, U.S. security. By ensuring Poland's national security, the U.S. is ensuring the region will be able to defend and deter aggression from Russia and other malign actors," said the embassy spokesperson.

The U.S. aerospace and defense industry is a preferred supplier to Poland, as demonstrated by recent sales of the Raytheon Patriot missile defense and Lockheed Martin HIMARS artillery rocket systems. Poland's Defense Minister Mariusz Blaszczak announced May 28 the country's intent to purchase 32 Lockheed F-35A fighter aircraft.

"Poland is one of a handful of NATO members which has committed to spending more than 2% of its GDP on defense because it will benefit the country economically as well. For example, much of the manufacturing or assembly of U.S. equipment purchased may be conducted in Polish factories and by Polish workers," the embassy spokesperson said.

# ASK AMERICA

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USA Partnership Pavilion

The USA Partnership Pavilion is America's headquarters on-site: an efficient location for buyers to meet more U.S. suppliers, a high profile showcase for American exhibitors to maximize their exposure and impact at the event, and a forum for all to share ideas and insights.



Apollo 15 CMP, Al Worden

Bolstered by the USA's "Lead Nation" status at MSPO 2019, Apollo 15 Command Module Pilot, Col. Al Worden, USAF-Ret, will attend the show as a designated "VIP" and goodwill ambassador for the U.S. defense and security industry.

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## ■ New Drone Tethering System

(ck) At DSEI 2019 Drone Evolution launches its new milspec drone tethering system which allows any drone/camera combination to fly for six hours at a height of up

Photo: Drone Evolution



to 200m, whilst transmitting data securely via a fibre-optic milspec cable. The military system is 24V, running off a military vehicle battery, and is controlled via a portable ground station which fits into a 40mm ammo can. The Dragon Tethered Drone (civil) version of this system has been proven over the past year and interest from the defence establishment has driven the development of the military prototype version. Development work is underway to enable beyond line of sight capability in the future.

## ■ Air and Sea Surveillance for Arctic Patrol Vessels

(ck) HENSOLDT will equip the Norwegian Coast Guard vessel SVALBARD with its TRS-3D naval radar and MSSR 2000 I IFF System. This is the second upgrade contract from the Norwegian Defence Materiel Agency as HENSOLDT is already under contract to equip the three new Arctic Coast Guard Vessels in

Photo: Hensoldt



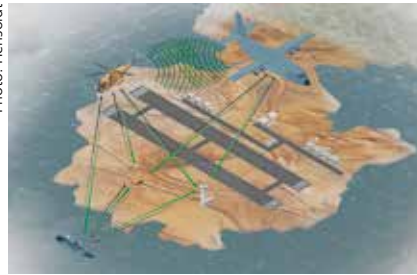
the P6615 Program with the upgraded radar and IFF system. The two contracts have a value of more than €27M. Under the contracts, HENSOLDT will deliver four TRS-3D radars and signal processing software from 2021 on, running parallel with the building programme of the Arctic Coast Guard vessels. The TRS-3D includes a secondary radar MSSR 2000 I for Identification-friend-or-foe (IFF). It operates all current IFF modes, including the latest "Mode S/Mode 5 Level 1/2" standard, answering the most recent NATO requirements. TRS-3D is a three-dimensional multimode naval radar for air and sea surveillance. It includes the ability

to correlate plots and tracks of targets with the MSSR 2000 I identification system for automatic identification of vessels and aircraft which is essential to avoid friendly fire and to establish a comprehensive situation picture. It is used for automatically locating and tracking all types of air and sea targets and safe guidance of on-board helicopters. Thanks to its signal processing technologies, the TRS-3D is suited for the detection of low flying or slow moving objects.

## ■ HENSOLDT's IFF Systems Obtain AIMS certification

(ck) The AIMS Program Office of the US Department of Defense has certified HENSOLDT's MSSR 2000 I identification system (MSSR = Monopulse Secondary Surveillance Radar). This makes HENSOLDT the first company outside of the USA to fulfil this critical prerequisite for delivering IFF devices (IFF =

Photo: Hensoldt



Identification Friend or Foe) for the upcoming conversion of all NATO identification systems to the future "Mode 5". AIMS certification is mandatory for non-NATO countries whose forces are deployed together with NATO nations in joint missions. The current certification confirms that the MSSR 2000 I is interoperable when used to identify NATO or allied forces in accordance with the future NATO standard Mode 5 and all previous modes (1, 2, 3/A, C, 4, S). HENSOLDT's other IFF products have also received the AIMS certification. The AIMS Program Office is the only organisation worldwide that certifies the technical performance of radar and IFF systems. IFF systems allow ships and aircraft to be identified by automatically sending interrogation signals, which are answered by so-called transponders on board friendly units. Field commanders are thus able to distinguish friendly from hostile forces. By 2020, all NATO states and their partner nations will need to have switched to the new, secure Mode 5 technology version.

## ■ Diver Delivery Vehicles

(ck) When it comes to covert operations in the open sea, safe insertion and extraction of Special Forces to and from the field takes on a great level of complexity. Divers can

Photo: JFD



become exhausted if exposed for long periods in the open water, particularly where there is a need for submarines and surface vessels to be kept as far away as possible from the area of operations in order to avoid detection. This often requires divers to swim great distances unless there is a Swimmer Delivery Vehicle (SDV) capability in place. JFD is a manufacturer of such SDVs, and its vehicles are designed to facilitate the safe insertion and extraction of Special Forces and their equipment from different types of vessels. Recently, JFD has acquired all the assets, IP and designs rights of Ortega Submersibles BV, a Netherlands-based submersible boat designer and manufacturer. The acquisition will allow JFD to expand its range of vehicles and capabilities to meet the increased market demand for specialised small and medium-sized vessels. JFD will retain Ortega's manufacturing facility and its team of engineers at the operational base in Enschede, The Netherlands. JFD will also expand its existing SDV manufacturing capability in Vaxholm, Sweden, and expand its offering to include new vehicles that will allow Special Forces operators to conduct their missions safely.

## ■ Deployable Containers for Dutch Army

(ck) Dutch Defence Materiel Organisation (DMO) has contracted Marshall Aerospace and Defence Group with a multi-million pound contract to supply deployable containers for the Netherlands Army. The contract comprises two main elements; the production of the various containers and

Photo: Marshall Aerospace



a support programme. The first container systems are already on their way to the Netherlands. These container units are part of the major Dutch Defensiebrede Vervangende Operationele Wielvoertuigen (DVOW) programme which will update the Dutch



Armed Forces with new vehicles, containers and support equipment. The initial warehouse units will be used to train operators in handling the containerised systems and to fulfil a training commitment for their vehicles and, after training, the units will be used for warehousing. These are the first of the 1400 container systems being delivered over the next five years which include Command and Control and medical container systems, workshops, controlled atmosphere and basic stores units, together with an initial 10 year fully integrated availability support package. As part of the design work Marshall is also providing a new expandable container which uses lighter materials but maintains the strength of its in-service Matrix Expandable products.

#### ■ Virtual Reality Software for US Air Force Trainers

(ck) MetaVR's Virtual Reality Scene Generator (VRSG) has been integrated into the US Air Force T-1A JAYHAWK twin-engine jet trainer aircraft as part of an embedded training device to provide a simulated mixed reality Electro-Optical/Infra-Red (EO/IR) training capability to the aircraft. The VRSG will be



Photo: MetaVR

installed on 21 T-1A JAYHAWK training aircraft at the base. VRSG forms part of the T-1A Combat System Officers Training System (CSOTS) embedded training device for the aircraft, which is used to train students in the operation of EO/IR sensors. VRSG generates the visuals for the system, resulting in a mixed reality training experience for trainees that combines simulated and live environments. In-flight EO/IR training is carried out using a generic simulated sensor model similar to the MX-20. A total of 15 flight paths between North Carolina and Louisiana can be flown during training exercises. The system is integrated with a third party computer-generated/semi-automated forces application so that students 'see' targets inserted into the simulated view. These targets – buildings, ground vehicles or other

aircraft – are models from MetaVR's model libraries. The sensor simulation approach helps reduce overall training costs to the US Air Force by providing an alternative to more expensive actual EO/IR sensors.

#### ■ SDRs for SEA LION

(ck) The German Navy has 18 Airbus Helicopters NH90 SEA LION aircraft on order to replace the ageing SEA KING Mk.41s, with first deliveries scheduled for the end of 2019. Rohde & Schwarz will equip the NH90 SEA LION helicopters with software defined airborne radios (SDR) of the SOVERON family including national cryptology. Each aircraft is fitted with three VHF/UHF transceivers M3AR MR6000A plus spares. Rohde & Schwarz is the only provider of military airborne radios that meet the civil aviation certification requirements of the European Aviation Safety Agency (EASA). Particularly for naval applications, the R&S M3AR MR6000A provides interfaces for connecting external devices such as an automatic direction finder (ADF), a Link 11 data terminal set (DTS), an improved data modem (IDM) or an external encryption device and guards the naval distress frequency.

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## ■ Secure VHF/UHF Radio for A400M

(ck) OCCAR has awarded Rohde & Schwarz a new performance-based support contract for the A400M aircraft which is now in service with Belgium, France, Germany, Malaysia, Spain, Turkey and the UK, supporting paratrooper deployment, transport and air-to-air refuelling capabilities. Rohde & Schwarz is the communications supplier for the A400M with its MR6000A software defined radios



Photo: Airbus

(SDR) of the SOVERON family. Each aircraft is fitted with four VHF/UHF transceivers. Rohde & Schwarz is the only provider of military airborne radios, which meet the civil aviation certification requirements of the European Aviation Safety Agency (EASA). Military aircraft can only be certified and operated without restrictions when they fulfil both military and civil requirements. The R&S M3AR airborne transceiver uses communications methods that were standardised throughout NATO, including the fast frequency-hopping technique SATURN (Second Generation of Anti-Jam Tactical UHF Radio for NATO), as well as embedded NATO cryptology. The R&S MR6000A has been SECAN and BSI certified to allow secure communications up to NATO Secret. By means of software downloads, the transceivers can already implement important functions required during a mission. This ensures that, for example, the A400 aircraft can be used in international air space under network centric warfare conditions. Almost 8,000 SDRs from the R&S M3AR airborne transceiver family are in use worldwide on over 70 different airborne platforms.

## ■ New 60mm Mortar

(ck) Rheinmetall has developed a new 60mm mortar for infantry and special forces. The RSG60 is very lightweight and



Photo: Rheinmetall

easy to handle. A few manual adjustments turn the 15.8 kg standard infantry version into a commando mortar weighing just 6.8 kg, with no need for tools which makes the RSG60 a two-in-one solution. Depending on the ammunition and charges, the standard version has an effective range of up to 3,200 metres. Equipped with a thirty centimetre-longer barrel, the range increases by around 500 metres. The commando variant of the RSG60 has a range of around 2,000 metres. About 70 centimetres long, the barrel is made of steel with a carbon fibre overwrap. This assures the necessary stability at the same time as lower weight, resulting in a barrel that weighs around 30% less than a conventional steel mortar. The base plate is made of carbon fibre composite material. The novel design of this indirect fire weapon saves space and it is ready to fire in a matter of seconds. By loosening the retaining bolts, it is possible to separate the RSG60 from the base plate in around thirty seconds, transforming it into lighter-weight commando mortar. The RSG60 has been tested successfully.

## ■ New RWS for Japanese Frigates

(Shinichi Kiyotani) For the new surface combatants of the Japanese Maritime Self-Defence Forces (MSDF), the Japanese MoD has ordered the newly developed indigenous Remote Weapon Station (RWS) which is called "Machinegun Mount for Surface Combatants (Remote Controlled Type)". The RWS is destined for two new FFM frigates with a displacement of 3,900 tonnes which were ordered from Mitsubishi Heavy Industries, and for the second ASAH



Photo: Shinichi Kiyotani

class DD SHIRANUI with a displacement of 5,050 tonnes which was commissioned in April 2019. The MoD will procure 22 FFM by 2037. The new weapon is the first RWS for the Japan Self-Defence Forces. Each of the two FFM frigates and the SHIRANUI will receive two RWS. The new RWS is a variant of the RWS developed for the vehicles of the Japanese Ground Self Defence Force (GSDF) by the Technical Research and Development Institute of the MoD; the main contractor is the Japan Steel Works, Ltd. The RWS was

developed and tested in FY2009 to FY2011. It is equipped with a thermal imager, stabiliser, video camera, laser rangefinder, and automatic tracking system. 5.56mm, 7.62mm, 12.7mm machineguns and 40mm automatic grenade launcher as main weapon can be installed. In many ways the Japanese RWS is similar to Kongsberg's SEA PROTECTOR. However, the indigenous RWS is easier to maintain for the MSDF which was an important requirement. It will be installed on the roof of the bridge and in front of the radar mast.

## ■ IED Jamming Manpacks

(ck) Improvised Explosive Devices (IEDs), such as roadside bombs activated by mobile phones, have become a common threat in today's asymmetric warfare, as they are easy to make. Reactive jamming systems promise to be a real-time counter-IED solution which is why the Spanish MoD has awarded a €65 million contract to Netline, a developer of electronic warfare systems, to supply its Counter IED System to the Israel Defense Forces (IDF). The vehicular C-GUARD Reactive Jamming (RJ) Manpack system is already being operated by the IDF, and is also in ongoing use by ground forces in NATO countries, Asia and Africa. Easily carried into the battlefield, the C-GUARD RJ Manpack system detects and prevents IED activation attempts. The system creates a secured zone around the soldiers, reacting to electronic warfare (EW) threats by jamming RF signals that are attempting to detonate the IED.



Photo: Netline

## ■ CAMCOPTER for Coast Guard Services

(ck) The Croatian Ministry of Sea, Transport and Infrastructure has issued a first request to the European Maritime Safety Agency (EMSA) for CAMCOPTER S-100 maritime surveillance services. EMSA will assist Croa-



Photo: Schiebel

tia in maritime Coast Guard functions such as search and rescue, monitoring and sur-



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and Press briefing will take place at the **Czech Pavilion – Stand N8-310**  
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**EVPU Defence** development, design and production of following products: electro-optical surveillance systems, infrared and optical sensors and laser rangefinders, Pan and Tilt positioners, multi-sensor containers, electro-optical equipment for armed vehicles, tanks, turrets and weapon stations



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**TOUCHLESS BIOMETRIC SYSTEMS** Software and hardware development for biometric and embedded systems, image and video processing, BBX is a device for scanning of military barrel bores (or other cylindrical shape cavities) with diameters from 105 mm to 155 mm.



**TRAAM** Specialist in production of composite safety and bulletproof glass for the military and civil sectors – glass for special trucks and civilian cars, glass cabinets for storing weapons, money, valuables, architectural applications (in buildings for government agencies, government and embassies, etc).



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#### Other Czech companies at DSEI 2019:

- Česká Zbrojovka – production of highly advanced CZ weapons
- Meopta Systems – production of world class optical products
- REDO – production of high-quality Modular Load Carrying Systems for armed forces
- Seller&Bellot – production of ammunition for pistols, revolvers, rifles and shotguns
- STV Group – production of ammunition for hand-held weapons, tanks, artillery, sappers
- SVOS – production of special armoured vehicles
- The Military Technical Institute – services for defence research, development and innovations

veillance, ship and port security, vessel traffic, environmental protection and response, ship casualty assistance, as well as accident and disaster response. For these purposes, the CAMCOPTER S-100 Unmanned Air System (UAS) will be based on the island of Brač and will carry out regular patrolling flights, on-demand incident monitoring missions and specific inspection operations. The S-100 will execute these tasks equipped with an L3 Wescam Electro-Optical / Infra-Red (EO/IR) camera gimbal, an Overwatch Imaging PT-8 Oceanwatch payload and an Automatic Identification System (AIS) receiver. EMSA awarded the multi-year maritime surveillance contract for a Vertical Take-off and Landing (VTOL) Remotely Piloted Aircraft System (RPAS) to Schiebel in November 2018. In execution of this contract, Schiebel will provide simultaneous maritime surveillance services to several European Union (EU) member states and EU bodies.

## ■ Thales to Equip Belgian Armoured Vehicles

(ck) According to a government-to-government agreement signed by France and Belgium at the end of 2018, the French defence procurement agency (DGA) has contracted Thales, on behalf of Belgium, to deliver onboard intelligence and future data capabilities for its new fleet of armoured vehicles. Under the CaMo programme, the Belgian land forces will procure 60 JAGUAR reconnaissance and combat vehicles (EBRC) and 382 GRIFFON multi-role armoured ve-



Photo: Thales

hicles (VBMR). Thales will be in charge of common combat vetronics, including communications, onboard computing and decision support solutions, and perimeter vision, self-protection and navigation systems. Thales' CONTACT software defined radio (called SYNAPS in export markets) provides the real-time communications needed for the forces to operate as a network. Thales will also provide the ANTARES 360° vision system, with its laser warning function and future incoming missile detection capability, to display local situation awareness on a screen inside the vehicle. The ECLIPSE new-generation active counter-IED system is built around a jammer that prevents IED from being detonated by remote control.

Thales's TopAxyz inertial navigation system, which will equip the Jaguar vehicles, is used to measure platform attitude and position even in the toughest operational conditions. The systems are connected to the central information system and limit the exposure of combatants to potential threats.

## ■ New Armoured Tactical Vehicle

(ck) At IDET 2019 Zetor Engineering presented its most recent development, the ZETOR GERLACH 4x4. The GERLACH is targeted at all markets where the replacement of outdated 4x4 vehicles is planned or underway; the vehicle is currently ready to participate in the Slovak international tender exercise. The GERLACH has undergone a variety of tests, including the explosion of 8 kg of TNT under its cabin. Mechanical or remote-controlled machine gun towers from various manufac-



Photo: ZETOR

turers, anti-tank guided missiles, mortars or grenade launchers can be mounted on the GERLACH. It has excellent terrain skills and can cross a terrain step of 0.5 m and a 1 m wide trench. GERLACH's cabin is designed as an overpressure armoured capsule fitted independently on the chassis, and it offers space for up to 6 crew members. The GERLACH comfortably handles a terrain rise of up to 70% (30° angle) and during testing it reached 100% (45° angle) under full load. On the Slovakia ring racing circuit it reached a maximum speed of 125 km/h, even in rainy conditions. The GERLACH is ballistically resistant up to STANAG 4569 Volume 1 Level 3. It can resist an anti-tank mine with a strength of up to 8 kg of TNT under the axle and under the cabin (NATO STANAG 4569 Volume 2 Level 3a, 3b). Acoustic tests have confirmed low noise and vibration levels in the cabin of 65 dB. The vehicle was loaded to a maximum weight of 14.2 tonnes.

## ■ ASCOD Offered to the Czech Army

(mj) The Czech MoD has recently sent out calls for preliminary offers in the long awaited tender for new tracked infantry fighting vehicles (IFV). General Dynamics European Land Systems (GDELS), as one of major armoured vehicles manufacturers in Europe, is expected to offer its tested ASCOD platform,

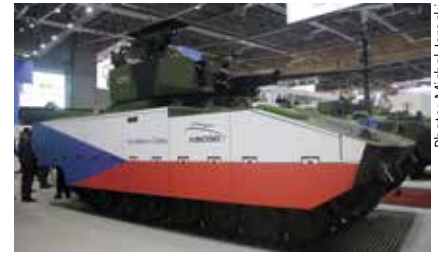


Photo: Michal Jarocki

which has been selected by the armies of Austria, UK and Spain in the ULAN, AJAX and PIZARRO programmes. The Czech Army has a requirement for 210 new IFVs, which will replace the nearly 200 legacy BVP-2 vehicles currently in service. The offer, customized in accordance with the Czech Army's requirements, will feature the ASCOD tracked platform and a selected turret system. At the IDET 2019 exhibition in Brno GDELS displayed the ASCOD with an unmanned UT30MK2 turret from Israeli Elbit Systems, which could be replaced by a manned MT30 system. During IDET 2019 GDELS' representatives said that the decision to couple the ASCOD with Elbit's turret was not a result of a Czech Army requirement, which probably at that time wasn't yet formally defined, but rather a result of a successful cooperation with the Israeli partner. However, the manufacturer underlined that it is ready to integrate its tracked vehicle with virtually every manned and unmanned turret system available. Essential as it is, the ASCOD platform is not the only part of the GDELS' offer for the Czech Republic, as the manufacturer points to expected benefits for the local defence industry arising from the future contract, assuming the Czech MoD decides to select the company as the preferred bidder. The manufacturer confirms its intention to set up a local production of new IFVs based on the ASCOD design and involve Czech defence companies in the process, which will be executed under a Transfer of Technology agreement. The future contract is also expected to provide a constant supply of spare parts as well as technical assistance and training support for crews and maintenance personnel. As a result of the future agreement, Czech defence companies would also become members of the manufacturer's global supply chain, enhancing their position on export markets by allowing to offer products and services to other users of GDELS' armoured platforms. GDELS is one of four manufacturers, which announced their intention to take part in the Czech tender. The company will most likely compete with BAE Systems, which offers its CV90 tracked vehicle, Projekt System & Management GmbH (PSM) consortium bidding the PUMA IFV and Rheinmetall with the LYNX platform.

## ■ Airborne Missile Protection Systems for UN Air Operations

(df) UN Air Operations has awarded an order for additional Airborne Missile Protection Systems (AMPS) systems to BIRD Aerosystems. Under the contract, BIRD will provide its AMPS-MV solution, which includes the MACS sensor, and install it on the UN Mi-17 helicopters operating in Africa. BIRD's AMPS is designed to automatically detect, verify, and foil SAM attacks through the effective use of countermeasure decoys (flares and chaff) and by Directional Infrared Countermeasures (DIRCM) that jam the mis-



Photo: BIRD Aerosystems

sile's IR seeker to protect the aircraft. The AMPS-MV includes BIRD's Missile Approach Confirmation Sensor (MACS) sensor, which confirms suspected incoming missile threats detected by the main electro-optical passive sensors. According to the company this practically eliminates any false alarms, and MACS also ensures that only real missiles will be declared by the system and reacted upon. "The UN Air Operations teams are operating in the most dangerous areas and conflict zones in Africa and therefore have to make sure that their helicopters are safe and protected against the constantly growing threat of MANPADS," said Ronen Factor, Co-Chief Executive Officer and Founder at

Bird Aerosystems. "As caring for its soldiers is a primary goal for the UN, we are honored that once again, they choose to do so using BIRD's AMPS-MV, the most advanced and cost-effective solution available today."

## ■ German Navy Selects NH90 NATO Frigate Helicopter

(wg) The German Navy announced that the NH90 NATO Frigate Helicopter (NFH) has been selected as the successor to the German Navy's SEA LYNX Mk 88A onboard helicopter. A total of 31 helicopters were ordered. A corresponding bill was approved by Vice Admiral Joachim Rühle, Deputy Inspector General of the Bundeswehr, on 29 July. The German Navy now has 18 Airbus



Photo: Airbus

helicopters NH90 SEA LION aircraft on order to replace the ageing SEA KING Mk.41s, with first deliveries scheduled for the end of 2019. The designation of the new onboard helicopter is "Multi-Role Frigate Helicopter" (MRFH) as the German version of the NH90 NATO Frigate Helicopter (NH90 NFH). The design is featuring commonalities with the French NFH (NFRS) CAIMAN version. In addition to Italy and France, the NFH is already in service with the navies of Belgium, Italy, the Netherlands and Norway. An Airbus Helicopters spokesperson wel-

comed the selection decision and said that at this stage the company does not yet have complete information on the requirements profile. Therefore, detailed information on the final design of the aircraft cannot yet be disclosed. What is certain, however, is that the MRFH will be developed on the basis of the NH90 SEA LION. At the request of the European nations, the NH90 was originally designed as a basic helicopter. It has a modular design and is available in Tactical Transport Helicopter (TTH) and NATO Frigate Helicopter (NFH) versions. In terms of technology, both helicopter versions are basically identical, but differ in their mission equipment. The NH90 NFH also serves as the basis for the SEA LION, successor to the SEA KING. According to the Navy, on-board helicopters are an integral part of the "frigate system." Equipped, for example, with sonar, radar and torpedoes, they are essential sensor and weapon carriers against sea targets above and under water. In addition, they can flexibly support maritime operations through transport and rescue operations. Derived from the capability profile of SEA LYNX currently in service, it is assumed that the successor's required key capabilities will be anti-submarine (ASW) and surface warfare (ASuW). In addition, Search and Rescue (SAR) missions and transport of people and material may be required. A challenge will be the hangar. Only the Class 124 and 125 frigates and the future MKS 180 of the German Navy are equipped with landing decks and hangars for embarking up to two NH90-sized helicopters. However, the hangar doors of the F124 would have to be adapted. The Class F123 frigates, on the other hand, cannot accommodate helicopters of this size, the hangar is too



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small for that. As a result, Class F123 frigates would not be able to accommodate onboard helicopters until the end of their service life (2030s).

## ■ Recovery Module for the BOXER

(wg) The BOXER is characterised by its modular design. It consists of two key elements: the driving module and the removable mission module. At DSEi in London, FFG Flensburger Fahrzeugbau Gesellschaft mbH (FFG) will present a recovery module for the BOXER.

Photo: FFG



As the BOXER is used internationally in different versions, different mission modules have been developed but thus far, there has not yet been a module for turning the BOXER into a recovery vehicle. The need for such a module arises from the deployment concepts of the armed forces, which require equipment that is as homogeneous as possible. Development of the recovery module started in October 2017 and production began in March 2019, followed by operational functional tests in July 2019. After the DSEi, extensive system tests are carried out. Afterwards the recovery module is prepared for series production. The armoured module weighs about 13 tonnes and can be equipped with remote-controlled weapon stations of various manufacturers, including the FLW 200. It offers space for two crew members, commander and gunner. The driver's seat remains in the driving module with direct access to the recovery module. In order to ensure maximum commonality with other mission modules, already existing components (for example CBRN protection, Heating, Ventilation and Air Conditioning systems) were used whenever possible. The recovery module is connected to the drive module via standard BOXER mechanical interfaces and requires a power connection for operation in order to charge the module battery. As a battery powers the hydraulic system the recovery module can also be used independently of the drive module. According to FFG, the pivoting crane boom is capable of conducting all standard repair and recovery missions. This includes, for example, changing engines (including its own), weapon towers or lifting the BOXER for a wheel change.

In addition, the module is equipped with a capstan winch at the rear, which can also be used for self-recovery, and has a wide range of special tools (cutting and welding equipment, pneumatic power tools). The module is stabilised by two hydraulically extendable support legs on the side in connection with a "rear anchor." They secure the BOXER during crane and winch operations and relieve the driving module of the associated stress. The semi-autonomous electro-hydraulic design of the module allows it to be used even when the engine is switched off. All systems are controlled and monitored centrally via touchscreen displays and FFG's proprietary software. In emergency mode, the hydraulics can be operated via a manual control system.

## ■ Protected PIRANHA 5 Vehicles for Spain

(gwh) The Spanish Council of Ministers has signed a contract for the procurement of 1,000 Vehículos de Combate a Ruedas (VCR) PIRANHA 5 in three lots. The main contractor is Santa Bárbara Sistemas, a subsidiary of General Dynamics European Landsystems (GDELS), which will manufacture the vehicles together with Indra and SAPA. The contract has a value of €2.1Bn, distributed in annual instalments ranging from 2019 to 2030. Five prototypes are already being tested by the troops. In the first lot, 348 PIRANHA 5 will be procured in 13 different configurations, including the respective mission systems (armament, protective elements, sensors, communica-

Graphic: GDELS



tion and command systems) and products for logistical support. Delivery is scheduled for 2022. A second lot of 365 vehicles is scheduled for 2022. Delivery of the third lot with 287 vehicles has not been scheduled yet. The PIRANHA 5 - known as DRAGÓN in Spain - weighs over 33 tonnes, depending on the equipment. It is 8 metres long, 3 metres wide and 2.34 metres high and can accommodate up to eight soldiers in the protected cabin, in addition to the regular crew of three. The vehicle is powered by Scania's 480 kW DC 13 diesel engine, produced under license from SAPA, with an automatic SW624 transmission from SAPA

and eight steered wheels with height-adjustable, hydropneumatic McPherson chassis technology. A 75 kW auxiliary power unit is installed for the continuous supply of electrical energy. The driving range is specified as 1,000 km and top speed as 100 km/h. The variants of the DRAGÓN under investigation include infantry combat vehicles and command vehicles with 30mm cannons, engineer vehicles with remote-controlled weapon stations and artillery observers with an observing platform. The DRAGÓN will replace the obsolete fleet of medium protected wheeled vehicles (Blindado Medio sobre Ruedas, BMR), including the 6x6 PEGASO, 4x4 LMV, 4x4 RG-31 and also the M113 tracked vehicles, with a single modular vehicle based on an open architecture.

## ■ INVISIO Headset Systems for US Marines

(df) The US Marine Corps has selected INVISIO for their Hearing Enhancement Program with a first order worth SKR43M (about €4M). The systems consist of both communications enabled versions and as well as hearing protection only. Infantry, artillery, reconnaissance and combat engineer Marines decided on INVISIO systems based on fit, form, function and comfort. The new headset systems will allow Marines to wear hearing protection and still be able to communicate and understand what is going on around them. The headset systems are rugged and capable of operating in a wide range of environments, from cold weather to extreme heat. The INVISIO systems are compatible with Marine Corps radios and the Marine Corps Enhanced Combat Helmet. "We are very excited and pleased to have won the competition for the Marine Hearing Enhancement Program," said Ray Clarke, CEO of INVISIO Communications. "We look forward to providing Marines with a suite of hearing protection and tactical communications systems combining both protection and capability."

Photo: INVISIO



## ■ Poland Completes the First Serial Production 155mm SPH Battery

(mj) The Polish Army is finalising completion of the first Regina artillery battery composed of serial production 155mm KRAB self-propelled howitzers (SPH) manufac-

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tured by Huta Stalowa Wola. Until now the unit has received 16 155mm KRAB SPHs as well as auxiliary equipment, such as 2 command staff vehicles, 6 command post vehicles, 4 ammunition supply vehicles and one



Photo: HSW

mobile armament and electronics workshop vehicle. Delivery of the final batch of equipment for the Sulechów-based Regina artillery battery is expected this autumn. The fully equipped battery consists of 24 155mm KRAB SPHs, three command staff vehicles, eight command post vehicles, six ammunition supply vehicles and one mobile armament and electronics workshop vehicle. Although the 155mm KRAB self-propelled howitzer is manufactured in Poland, the platform itself is based on several foreign designs, which includes the K9 THUNDER chassis from South Korea, the British BAE Systems AS90/52 BRAVEHEART turret and the German L52 155mm gun. The first serial production Regina artillery battery, and the ones which will be subsequently delivered up to 2024, will supplement the original, initial production battery commissioned on 31 September 2017 and operated by the 11th Masurian Artillery Regiment in Wejgortzewo, subordinate to the 16th Mechanised Division in Białobrzegi. According to original plans, the 155mm KRAB SPHs were supposed to be based on the "Universal Tracked Chassis – New Generation" platform designed by the OBRUM company, a member of the Polish Armaments Group (Polska Grupa Zbrojeniowa, PGZ) holding, which is also a parent company for the HSW. However, after several years of development as well as numerous tests and trials of the initial batch of KRAB SPHs delivered to the 11th Masurian Artillery Regiment at the end of 2012, it became clear that the locally designed chassis is full of technical defects and further works on it were pointless. Therefore, the decision was made to procure a license for production of a new chassis based on a foreign design. After months long evaluation process the MoD and HSW decided to select the South Korean K9 THUNDER platform as the desired chassis for all 120 KRAB SPHs. The agreement with Hanwha Techwin, signed at the end of 2014, called for the initial batch of 24

K9 chassis to be delivered to Poland directly from South Korea for integration with the AS90/52 BRAVEHEART turret. These were to be followed by a dozen platforms sent to HSW in modules for final assembly. According to the agreement, the final batch of 84 K9 chassis will be manufactured directly by the Polish company based on the transfer of technology procedure.

## ■ US Army Heavy Dump Truck Programme

(df) Mack Defense is partnering with Crysteel Manufacturing on the US Army M917A3 Heavy Dump Truck (HDT) contract. The Mack Defense M917A3 HDT is based on the commercial Mack GRANITE model and



Photo: Mack Defense

has been optimised to meet the current needs of the US Army. Mack Defense added heavier-duty rear axles, all-wheel drive, increased suspension ride height and other rugged features to ensure the M917A3 is capable of meeting the demanding payload and mobility requirements of the US Army HDT programme. The Crysteel dump body for the M917A3 which has been developed in collaboration with Mack Defense, provides durability, safety and functionality in the field. It has an integrated touchscreen control module, which gives the operator key safety and functionality information at their fingertips. From this integrated hub, the driver is able to control the hoist, tailgate, tarp, thermostatic body heater system, material control system, the inclinometer and the on-board weigh scale. "We needed partners that could engineer and build components tough enough to pair with the Mack Defense M917A3 and meet the US Army's demanding applications," said David Hartzell, President and CEO of Mack Defense. "Crysteel Manufacturing fits the bill, thanks to their decades of leadership in their industry, and we are proud to have them as a partner on this project." Brett Hart, General Manager of Crysteel Manufacturing, added: "Developing the dump body for the M917A3 Heavy Dump Truck for our country's military is a project Crysteel is proud to be a part of. Our team has worked with Mack Defense to bring the highest level of innovation in durability, safety and func-

tionality in order to develop a dump truck that supports and exceeds the US Army's requirements."

## ■ The LAMANTIN Aircraft Carrier

(yl) Nevskoe Design Bureau distributed information on a potential aircraft carrier Project 11430E codenamed LAMANTIN. The ship's model was displayed at the bureau's booth at the United Shipbuilding Corporation (USC) pavilion. Allegedly, the LAMANTIN is designed for aircraft capable of engaging air, sea and ground targets in oceans, seas and coastal waters and to ensure combat sustainability of warship formations and defend amphibious assault from an air attack. The LAMANTIN can be equipped with several types of accelerators for ship-borne aircraft, including one ski jump, two electromagnetic catapults, and four arresters. The LAMANTIN class carrier displaces 80-90,000 tons. It is 350-metre long and 41-metre wide. The draft is about 12 metres. Full speed is close to 30 knots and the cruising capacity is 120 days. The crew comprises 2,800 men plus 800 airborne personnel. The aircraft carrier will accommodate up to 60 aircraft (planes and helicopters) and 6-10 unmanned aerial vehicles. The ammunition onboard can reach 1,600-2,000 tonnes. The equipment includes an automatic control system of the



Photo: Yury Laskin

operational and tactical level, an integrated communications and data exchange set, an automatic ship control system, a complex system to control technical means, and an auxiliary power plant. "The conceptual project of the LAMANTIN carrier is based on the legacy of the Project 1143.7 heavy nuclear-powered aircraft-carrying cruiser ULYANOVSK. So, we and the Russian Navy offer to consider the option of a nuke power-plant," Aleksey Yukhnin, deputy director for shipbuilding and military cooperation at Nevskoe Design Bureau told Mil.Press Today.

## ■ Launch of SUFFREN Submarine

(hum) According to a Twitter message from the French procurement authority Direction Générale de l'Armement (DGA), the new French BARRACUDA hunting submarine was launched (in a dock) on 1 August. The unspectacular act strengthens the impression that the rolling out of the construction





Photo: Naval Group

hall staged on July 12 was in connection with the French national holiday (14 July). The next steps are preparation and loading of the core with fuel rods (completion scheduled for September 2019) and commissioning of the reactor in November. First diving tests of the SUFFREN are expected for early 2020. Relocation to Toulon is scheduled for summer 2021. After the takeover by DGA, further tests are planned there (including the new MdCN cruise missile and F21 heavy torpedo weapon systems) until they enter service at the end of 2020. The BARRACUDA programme includes investments of €9.1Bn. Four of the six sister ships of the SUFFREN are already under construction. President Emmanuel Macron announced the order of the sixth hunting submarine in a speech

on July 12. The future DUGUAY-TROUIN, TOURVILLE and DE GRASSE submarines will be delivered in 2025 and 2026. Submarines No.5 (RUBIS) and No. 6 (CASABIANCA) will be commissioned in 2027 and 2029. The SUFFREN is the 108th submarine built in Cherbourg since 1899.

### ■ Military Satellite Communications in the High North

(df) Under its Enhanced Polar System Recapitalization (EPS-R) Control and Planning Segment (CAPS) Program, the US Air Force awarded a US\$82M contract to facilitate mil-



Photo: NGC

itary satellite communications in the Arctic to Northrop Grumman. The company is the provider for all three major components of the EPS-R CAPS Program. The US Air Force's EPS provides secure, jam-resistant satellite communications to forces in the North Polar region (above 65 degrees north latitude)

in support of national objectives. CAPS is a next-generation ground system that receives telemetry and supplies configuration commands, mission planning and cryptographic planning for the EPS and EPS-R polar-orbiting payloads. The authority to proceed granted by this contract includes the development of software for the EPS-R CAPS, taking the programme from requirements analysis to the test and delivery stage. The contract also addresses international host accommodations provided by Space Norway for new out of band link functions, cyber architecture, orbit planning, and the capability for controlling two additional EPS-R payloads on a single software baseline in addition to the two existing EPS payloads.

### ■ Military MIN MAC Rack

(df) PELI announced that their configurable MIN MAC Rack received even more military certifications. After successful completion of new military test certifications for drops (MIL-STD-



Photo: PELI

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810G), water immersion (IPX7) and dust ingress protection (IP6X), this rugged case line secured another protection certificate. The PELI MIN MAC Rack range is available with 5 different frame heights (4U, 6U, 8U, 10U and 12U), each available with 2 different rack lengths (480 and 610mm), making a total of 20 configurable ready-to-order rack cases. Designed to meet military standard requirements (such as MIL-STD-810G), it answers the need of making the most of limited space, while providing rugged protection for the equipment. The MIN MAC Rack's angled elastomeric shock mounts are fine-tuned to match the weight and fragility of the equipment to achieve maximum shock and vibration isolation. The high-strength, lightweight, heat treated, square holed steel rack frame of the MIN MAC Rack offers various mounting options for single or multiple fragile military equipment. The MIN MAC Rack will be shown at PELI's booth at DSEI.

## ■ Project 22350 Frigate

(yl) At IMDS 2019, the ADMIRAL KASATONOV frigate made a first debut; it is the second of the series and the first serial ship of Project 22350. By the end of 2019, the Navy will adopt the Severnoye Design Bureau ship. In summer 2018, the Russian Navy commissioned the ADMIRAL GORSHKOV as the first ship of the project. By April, 2019, it had crossed three oceans



Photo: Yuri Laskin

and arrived in the Chinese port of Qingdao to take part in the 70th Anniversary of the People's Liberation Army Navy. Another two frigates – ADMIRAL GOLOVKO and ADMIRAL ISAKOV – are under construction at the Severnaya shipyard in St. Petersburg. The Project 22350 multifunctional frigates are the first surface warships to be completely designed and built from scratch in Russia not relying on previous Soviet designs. They displace about 5,000 tonnes and reach a top speed up to 29 knots. They adopt the newest weapon systems and equipment, including KALIBR missiles and the POLIMENT-REDUT ship-borne AD system, and can be used for a number of missions.

## ■ DESPOT Presented at Partner 2019

(df) At Partner 2019 in Belgrade, TRB presented the new DESPOT vehicle, a prototype of which was revealed the National Day of the Republic of Srpska on 9 January 2019.



Photo: Peter Bossdorf

DESPOT is a protected multi-purpose, survivable off-road 4x4 vehicle, jointly developed by TRB and the Government of Srpska. The vehicle's ballistic protection corresponds to STANAG 4569 level 2, or optionally level 3. It is also protected from explosions of level 2a and 2b under STANAG 4569. DESPOT is 6.05 m long, 2.70 m high and 2.56 wide. The maximum weight is 14 tonnes. The passenger area has a volume of 12 m<sup>3</sup> and can comfortably accommodate 9 crew members. DESPOT can carry a payload of over 3 t. Maximum speed is more than 120 km/h, with the ability to overcome gradients of 50%, lateral gradients of 30%, vertical obstacles of 0.5 m, fording of 1.1 m, with an approach angle of 40° and departure angle of 43°. Engine power is 240 kW, with automatic transmission. It has a driveline system with independent suspension, run-flat inserts, a central tire inflation system, anti-lock braking system (ABS) and various other equipment. It is able to operate at temperatures ranging from -30°C to +50°C. Two 240Ah generators supply the vehicle with electricity. According to the company, various weapon stations can be integrated into the vehicle.

## ■ Amphibian Protolab PMPV 6x6 for Finland

(gwh) The Finnish armed forces have received the first four Protolab 6x6 MiSu protected multi-purpose vehicles. The Protolab Protected Multi-Purpose Vehicle (PMPV) 6x6 was designed by the company Protolab Oy, which was commissioned by the Finnish Defence Force (FDF) in 2018 to supply the four



Photo: Protolab

vehicles. Protolab's highly manoeuvrable and agile PMPV has a Euro-3-compliant Cummins 6.7-litre multi-fuel engine and thus meets the criteria for an EC N3G truck. Maximum speed is 110 km/h on the road and 12 km/h in water; the operating range is 900 km. The PMPV weighs around 14 tonnes and can carry up to ten fully equipped soldiers in addition to a crew of two. Payload is about ten tonnes. With a vehicle length of 7.44 m, a vehicle width of 2.55 m and a vehicle height of 2.70 m, it is also well-suited for urban terrain. To improve manoeuvrability, both the front and rear axles can be steered. Integrated mine protection and customer-specific ballistic protection according to STANAG 4569 are design-specific elements. Customer-specific weapon stations can also be integrated. The amphibious PMPV 6x6 MiSu can be configured for a variety of purposes, for example as a patrol vehicle, crew transporter, supply vehicle, command vehicle or ambulance vehicle. In addition, the Protolab PMPV is one of the first crew carriers to meet the mobility, protection and communication needs of special forces and paramilitary security forces. As part of a major modernisation programme aimed at modernising and improving the EFD's protected fleet, the new vehicles are now being tested by the troops.

## ■ Project 22800 Corvette

(yl) At IMDS 2019, the lead ship of Project 22800 – the KARAKURT class corvette MYTISCHI – received considerable attention. The corvette was designed by the Almaz Central Marine Design Bureau and was manufactured by the Pella shipyard. Project 22800 is the most numerous series of ships to be built simultaneously at Russian shipyards, and the lead ship MYTISCHI has been in service with the Russian Navy since late 2018. Another 10 corvettes are being tested or constructed at the moment. In total, the Russian Navy signed orders for 18 ships of the KARAKURT class. The KARAKURT ships are equipped with versatile launchers of the UKSK 3C14 type which can launch KALIBR and ONIX cruise missiles and their equivalents (YAKHONT, BRAHMOS), as well as ZIRCON hypersonic missiles, as soon as they enter service. In addition, the ship is equipped with an improved gun mount (GM) of the AK-176MA type with higher shooting accuracy due to the use of electric



Photo: Yuri Laskin

actuators. The first pair of the KARAKURT class corvettes is armed with the AK-630M rapid firing GM. Beginning with the second serial-produced corvette SHKVAL, the ships will be equipped with the PANTSIR-M air defence missile system which is a seaborne version of the land-based PANTSIR-S1 air defence system proven effective during Russia's campaign in Syria. An export version of the ship – Project 22800E – has attracted interest among several foreign customers at international naval shows. According to experts, the corvette may be of interest to Russia's traditional partners like India and Vietnam, as well as other countries in Southeast Asia, Africa, and the Middle East.

### ■ Tactical Boost Glide Hypersonic Weapons Programme

(df) The Defense Advanced Research Projects Agency (DARPA) and Raytheon successfully completed the baseline design review for the Tactical Boost Glide hypersonic weapons programme. A boost glide weapon uses a rocket to accelerate its payload and achieve hypersonic speeds – velocities greater than Mach 5. During flight, the payload separates from the rocket and glides unpowered to its des-

tinuation. The US military will use hypersonic weapons to engage from longer ranges with shorter response times and with greater effectiveness than current weapon systems.



Artwork: Raytheon

Hypersonic missiles are cheaper to produce and easier to maintain than fighter jets. So one or some of those missiles starting from somewhere around the globe, soaring and maneuvering through the atmosphere faster than five times the speed of sound, would be very hard to stop. This is why there is almost a rush on hypersonic missiles in the major armed forces worldwide. Russia and China both claim to have tested hypersonic systems. "In the last year, China has tested more hypersonic weapons than we have in a decade," Michael Griffin, the Pentagon's top weapons researcher, said at a National Defense Industrial As-

sociation-sponsored event in December. "We have got to fix that. Hypersonics is a game-changer." One of the major steps for the US is the Tactical Boost Glide hypersonic weapons programme. The now completed baseline design review follows a US\$63M DARPA contract to further develop the Tactical Boost Glide programme, a joint effort between the agency and the US Air Force together with Raytheon as industry partner.

### ■ Germany Procures PAC-3 MSE Missiles for PATRIOT

(gwh) The US State Department has approved the sale of 50 anti-aircraft missiles for Raytheon's PATRIOT air defence system. PAC-3 MSE (PATRIOT Advanced Capability 3, PAC-3; Missile Segment Enhanced, MSE) is one the most advanced missiles. In addition to the missiles, the contract worth €360M includes conversion kits, training equipment and numerous accessories required for the operation of the new missiles, as well as technical and logistical support services. PAC-3 missiles are suitable for combating ballistic missiles. Radar seekers and additional control nozzles provide the necessary agility to destroy targets directly

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(hit-to-kill) or with proximity fuses. The MSE combat enhancement results in a much greater range and maneuverability with a larger, double-pulsed solid rocket motor; larger control surfaces, improved actuators and novel batteries. In addition, there is



Photo: USASAC

an up-to-date data link for communication between the missile and the ground station. A few weeks ago, funds were made available for the upgrade to version 3+ of the PATRIOT system, which was introduced into the Bundeswehr. Introduction into the armed force is scheduled for 2022. PAC-3 MSE are also suitable for use with the Tactical Air Defence System (TLVS), which is currently in procurement negotiations with the Bundeswehr.

## ■ US Navy Gets Next Generation Jammer Mid-Band Pod

(df) The first Next Generation Jammer Mid-Band (NGJ-MB) pod has been delivered to the US Navy to begin ground and aircraft integration testing. Raytheon will deliver 15 EMD (Engineering and Manufacturing Development) pods for mission systems testing and qualification as well as 14 aeromechanical pods for airworthiness certification. NGJ-MB is a high-capacity and power airborne electronic attack weapon system for the EA-18G GROWLER. Raytheon's NGJ-MB architecture and design include the ability to operate at a longer range, attack multiple targets simultaneously and advanced jamming tech-

Artwork: Raytheon



niques. The technology can also be scaled to other missions and platforms. The jammer will protect air forces by denying, degrading and disrupting threat radars and communication devices. "The first NGJ-MB pod is out the door," said Stefan Baur, Vice President of Raytheon Electronic Warfare Systems. "We are one step closer to extending the Navy's jamming range and capability. Delivery of this

pod will allow for the initial verification of ground procedures, mass properties, aircraft installation, and built-in test checks in preparation for future chamber and flight test."

## ■ RUBEZH-ME

(yl) A new lightweight version of the BAL-E coastal defence system was unveiled at IMDS 2019. RUBEZH-ME is designated for the export market, particularly for littoral states with modest budgets. Reportedly, the developer is the JSC Research and Production Enterprise Kaluga Instrument-Making Plant Typhoon. Typhoon joined efforts with Tactical Missiles Corporation to create a shore-based missile platform which inherited the best features of its predecessors. The RUBEZH-ME provides over-the-horizon detection, tracking and engagement of individual surface targets, groups of ships, as well as ground targets. Unlike the BAL system which is based on three vehicles, the RUBEZH-ME is based on a single KAMAZ 8x8 off-road chassis but deploys the same Kh-35UE family of anti-ship missiles. The RUBEZH-ME complex includes a self-propelled command and control and communications centre (SKPUS) equipped with the MONOLIT-B radar and autonomous self-propelled launchers (SPU). A centralised fire control is implemented by using a self-propelled command and control and com-

Photo: Yury Laskin



munications command centre (SKPUS), which provides target designation and optimal target distribution between launchers, depending on their combat readiness and location in a combat position. The presence of high-precision active and passive radar detection channels allows for a flexible detection strategy. RUBEZH-ME can be deployed in less than 15 min. The vehicle operates efficiently at an altitude up to 1 km above sea level and 10 km from the coast line. The MONOLIT-B radar allows the RUBEZH-ME to engage targets up to 250 km in active mode and covert detection of the radiation emitted opposing radars up to 450 km in passive mode. There is an option to combine up to 8 SP vehicles into a task force for joint detection and engagement of targets with a volley of 32 anti-ship missiles. RUBEZH-E can be deployed either independently or in combination with already in-service BAL-E and BASTION-P (when

equipped with the MONOLIT-B radar) with all data-exchange processes carried out automatically. Typhoon has also arranged the first public appearance of the MONOLIT-B shore-based reconnaissance system of sea-surface/aerial situation in the module configuration. The MONOLIT-B system is designed for long-range over-the-horizon detection and tracking of sea surface and aerial targets. It is mobile, fits on any chassis, quickly deployable, and can operate as a self-propelled or a stationary version. The active radar of the system is capable to detect targets at a distance of up to 500 km, and the passive one of up to 750 km. The crew of the self-propelled version consists of 5 men, and the mobile and the stationary versions of 4 men.

## ■ The Small Missile Ship SERPUKHOV

(yl) One of the highlights of the IMDS 2019 was the latest SERPUKHOV small missile ship of the Project 21631. The vessel has been designed by the Zelenodolsk Bureau and was built at the neighbouring Gorky Shipyard. The ship has a displacement of 949 tonnes, a speed of 25 knots and an operational range of up to 1,500 nautical miles. The ship's main weaponry are eight KALIBR missiles and a A-190 100mm artillery unit. Air defence protection is provided by 2x4 GIBKA launchers with IGLA-type missiles and a DUET artillery turret with 2 AK-630 six-barrel 30mm guns. Close defence employs 2 x14,5mm and 3 x 7,62mm machine guns. On 15 August 2016, SERPUKHOV and its sister ship ZELENYI DOL successfully participated in an anti-terror operation in Syria launching KALIBR missiles against

Photo: Yury Laskin



terrorist bases. The UAE and Saudi Arabia Navy Commanders as well as high ranking delegations from Nigeria, Thailand and Vietnam showed interest in AK Bars' products including the GEPARD 3.9 frigate, the Project 21631 small missile ship, the Project 21980 special-purpose boat and the Project 22160 patrol vessel, according to the AK Bars Holding spokesperson.

## ■ Upgrade for Polish T-72 MBTs

(mj) The Polish MoD signed a contract worth €400M with a consortium of consisting of

the Polish Armaments Group (Polska Grupa Zbrojeniowa, PGZ), Zakłady Mechaniczne (ZM), Bumar-Labedy and Wojskowe Zakłady Motoryzacyjne (WZM), for an upgrade of a number of T-72M1 main battle tanks (MBT). Work will begin this year and last until 2025. The programme includes the upgrade of more than 300 Polish T-72M1 MBTs. According to the MoD, only 257 T-72 tanks are currently operational which means that the upgrade programme will include a number of phased-out platforms currently stored in reserve by the Military Property Agency AMW. "We are modernising the equipment, which is in the inventory of the Polish



Photo: Michal Jarocki

Army. Thanks to this upgrade, main battle tanks will be equipped with modern targeting, navigation and observation systems, as well as new digital comms," said Mari-

usz Blaszczak, the Minister of Defence. As a result of the modernisation programme, the MBTs' full operational capability will be restored. It is expected that a number of other defence companies, such as PCO or OBRUM, will be involved in the whole process. The MoD emphasizes that the upgrade of the T-72 MBTs is just an interim solution before launching a procurement programme for a new generation main battle tanks under the "Wilk" programme. "We all await the start of construction of new generation tanks by the Polish defence industry," acknowledged Minister Blaszczak. It is expected that when the next generation MBT finally enters service, it will replace the aforementioned T-72M1s and PT-91s. Furthermore, it will complement the more modern LEOPARD 2PL/2A5 tanks.

### ■ URAN-9 Unmanned Combat Ground Vehicle

(yl) At the ARMY-2019 International Forum, the Russian Army Corps of Engineers presented several new vehicles for various application. One of the highlights was the URAN-9 Unmanned Combat Ground Vehicle (UCGV) which entered service with the

Russian Army in January 2019. The machine is a robot employing the specially designed tracked chassis. The power unit is a diesel-electric engine with 300 hp and electric transmission. The range is up to 3 km. The vehicle is equipped with a 30mm 2A72 automatic gun, a 7.62mm PKTM machine-gun, and 4 guided missiles of the ATAKA 9M 120-1 PTUR type plus 6 (or 12) SHMEL-M thermobaric rocket launchers. The Russian designation of the vehicle is BMRK which stands for Combat Mobile Reconnaissance – to fully describe the vehicle determination. The vehicle has been combat tested in Syria. It entered army service following an impres-



Photo: Yuri Laskin

sive performance at the Vostok-2018 military exercise. The manufacturer is now working to increase the vehicle's range, response time and data bandwidth.



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## The Future of Germany's Integrated Air & Missile Defense



Photos: Raytheon International

**Bruce R. Eggers, Raytheon's Business Development Director for German Integrated Air and Missile Defense**

### Germany recently made the decision to upgrade its Patriots to the most modern configuration currently available – Configuration 3+. Why is that significant?

**Eggers:** Germany, the Netherlands, as well as five other European nations and the US, entrust Europe's Integrated Air and Missile Defense to Patriot. By upgrading to Configuration 3+, Germany has the latest updates to address evolving threats and remain compatible with its allies for many years to come.

### Can Patriot handle the next generation of threats?

**Eggers:** Yes. We are offering Germany our next generation Patriot solution which addresses advanced threats with a cutting-edge, 360-degree radar that has undergone more than 3,000 hours of testing. Commanders also have operational flexibility due to Patriot's missile mix of GEM-T interceptors and the PAC-3 MSE interceptor. Of course, those interceptors are already

integrated into Patriot Configuration 3+. We have the additional capability to integrate IRIS-T SL, subject to the permission of both the German and US governments.

Together with Rheinmetall's solution, all of this fits into a seamless architecture that can cover Germany's ground-based air defense needs.

### Is next generation Patriot a German solution?

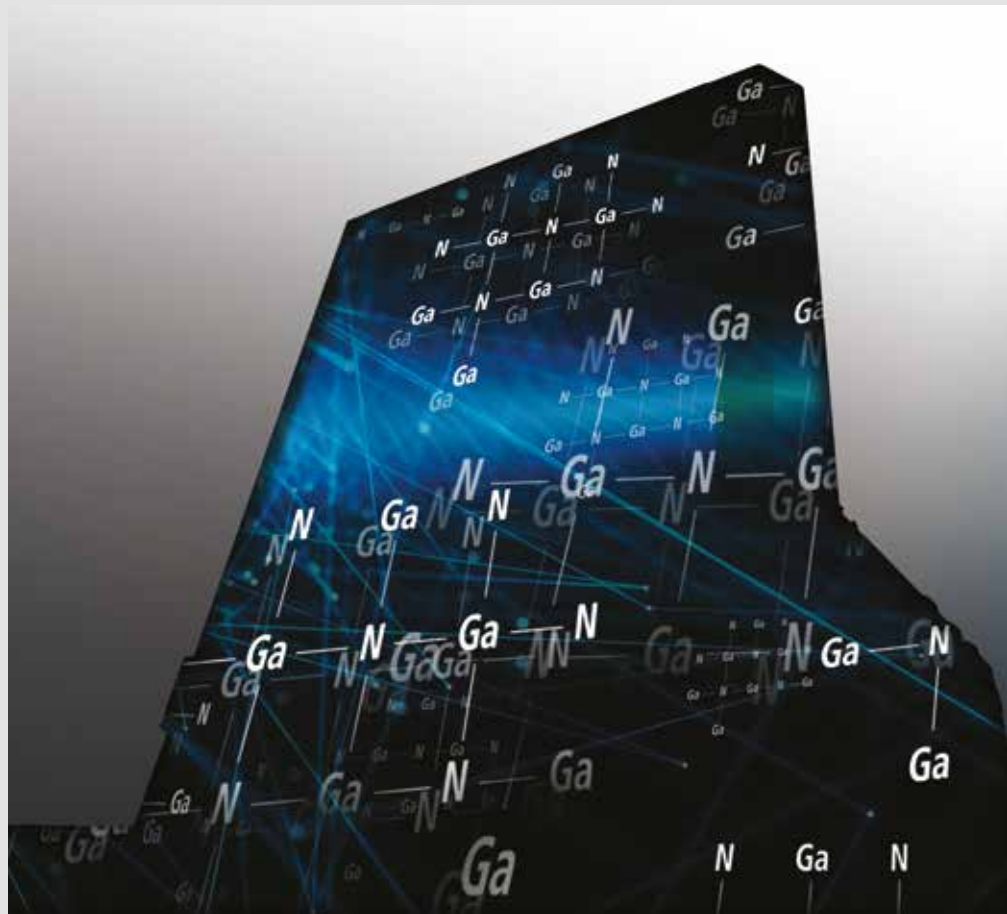
**Eggers:** Absolutely. Raytheon has a global strategic partnership with Rheinmetall, and they are integral to our solution. We talked about the opportunity to integrate IRIS-T SL already. Beyond that, and with the permission of the US and German governments, we could potential-

ly incorporate German medium-range radar, and German made command, control and communications.

I'd also point out that MBDA currently does work on German Patriots, and the Patriots of other partners. We would not anticipate that changing.

### Do you think there is any truth to the claim made by your competitors that MEADS represents the future, while Patriot is the past?

**Eggers:** The reality is that MEADS is built on a foundation of obsolete technology that never made it through the formal systems qualification process. In 2011, the US Army decided to terminate



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participation in the program because MEADS was billions over-budget and years behind schedule. MEADS has since languished as technology marched on. Consider your mobile phone in 2011 and compare it to where it is today.

Patriot certainly has the same name that it had when it was first fielded – and even looks the same on the outside – but the resemblance ends there. Patriot’s technology is constantly refreshed, tested and upgraded thanks to continued investment by the entire Patriot partnership.

Patriot is the air and missile defense system of choice for 17 countries. Four new countries have joined the partnership since November of 2017 – the Kingdom of Bahrain is our newest addition, having joined in August. Those countries looked at the threat, evaluated the data, and made their choice for today and for the future. How many countries have selected MEADS?

### **But the threat is constantly evolving and improving. Is not a new system – MEADS – required to address that?**

**Eggers:** Threats have always evolved and improved. An air defense system must be constantly upgraded and enhanced in order to outpace threats, regardless of who makes it. Maintaining this constant pace of improvement would be incredibly expensive if one nation had to go it alone.

The 17 countries which collectively own more than 220 Patriot fire units pay for modernization and upgrades which are based on testing and lessons learned in ongoing operations. In addition to being obsolete, MEADS is untested against the spectrum of air and missile threats it claims to be able to address.

MEADS development has a reported €8 billion price-tag, so let’s assume that at some point in the future it does get built.

But the threat isn’t going to stand still. Is Germany prepared, as the only member of the MEADS Club to pay all of these bills?

### **You talk about Patriot being a proven solution, but there have been some high-profile stories about Patriot failing in combat. How do you respond?**

**Eggers:** I’m not going to comment on specific operations, or the inaccuracy of press reports, but I think the facts speak for themselves. The governments of 17 nations have used facts and data to determine Patriot should be the backbone of their IAMD. The U.S. Army & other Patriot partners have conducted more than 1,500 flight tests and 3,200 ground tests on Patriot. Patriot was used by five nations in combat, and has intercepted more than 250 tactical ballistic missiles in combat. Facts matter, and the reality is Patriot saves lives.

# Sea of Troubles

## Rivalry over Gas Resources in the Eastern Mediterranean

**Stephen Blank**

**In the Eastern Mediterranean, as elsewhere, energy security is inextricable from hard security. The Eastern Mediterranean has long been a 'sea of troubles' and now rivalry and strife, especially over newly-found energy deposits, are coming to the fore.**

The current rivalries over these energy deposits build on years of pre-existing tensions among regional and extra-regional actors. These new deposits refer to the post-2009 findings of huge gas fields off Israel, Egypt and Cyprus' waters in the Eastern Mediterranean. And similar finds off Lebanon's coast are very likely. In May, Turkey began drilling for gas and oil in Cyprus' Economic Exclusion Zone (EEZ) as defined by Cyprus' adherence to the UN Commission On the Law Of the Sea Treaty (UNCLOS). To ensure its uncontested freedom of action, Turkey also interposed its navy in these waters.

Turkey's intervention threatens both the producers' ability to explore for gas and build a pipeline to Greece and Cyprus' security because it inflames issues arising from Cyprus' unresolved division. It also represents a threat to Greece, and is one of a growing number of mainly Russo-Chinese threats to UNCLOS and the Law of the Sea. The threat to Cyprus is long-standing. Ankara has repeatedly threatened to intervene in Cyprus' waters, with President Erdogan frequently dispatching ships and fighter aircraft to violate those waters and airspace, blatantly disregarding treaties or other powers' protests. Thus, Turkey is challenging the entire international community beyond the Levant, as its drilling in Cyprus' EEZ undermines the provisions of the UNCLOS that Nicosia has signed.

### Author

**Dr. Stephen Blank** is a Senior Fellow at the American Foreign Policy Council. He is the author of numerous foreign policy-related articles, white papers and monographs, specifically focused on the geopolitics and geostrategy of the former Soviet Union, Russian Federation and Eurasia. He is a former MacArthur Fellow at the US Army War College.

Photo: Stena Drilling



**Using the Stena ICEMAX drill ship, ExxonMobil has made a huge natural gas discovery at the Glaucus-1 well off Cyprus.**

Recent discoveries have demonstrated the abundance of these gas deposits, for example, Exxon-Mobil's discovery of the third largest gas discovery since 2017, the Glaucus or Glafcos field, that is estimated to be at least 10 TCF (Trillion Cubic Feet) off Cyprus. Similarly, ENI has announced the recent find of Egyptian gas in the Nour project about 50 km north of the Sinai desert. Therefore, Turkey apparently is also conducting financial manoeuvres here to gain access to this energy. A little known Cyprus-based firm, Cynergy Group, with contacts to the TRNC, has just bought between US\$5-10Bn of gas assets in the region to accelerate exploration and marketing of regional gas finds.

Turkey also claims that the Glaucus or Glafcos gas field is not in Cypriot waters but belongs to Egypt, highlighting thereby its efforts to undermine the Cypriot state and economic foundations. Hence, Turkey is challenging not just Cyprus, UN and UNCLOS, as well as regional producers and consumers to bring these gas finds to market, it is also challenging the international maritime order.

### The Cyprus Issue

Turkey's intervention stems from many motives. First, it grows out of the larger clash with Greece in 1974. Greece then forcefully and unilaterally set up a fun-



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damentally Greek-speaking Cypriot state and Turkey responded by equally forcibly and unilaterally dismembering part of it to set up a Turkish 'state', the Turkish Republic of Northern Cyprus (TRNC). Despite ongoing efforts to mediate this dispute, since then both sides have, at one time or another, obstructed progress. Turkey now also sees Cyprus's exploitation of energy holdings as a way to gain additional economic and political power vis-a-vis the TRNC and coerce it into submission. Ankara will not allow that. Therefore, it has repeatedly conducted naval operations for years, including its newest drilling activity in Cyprus' EEZ, to disrupt and obstruct the Cyprus's energy explorations in what, for Turkey, are disputed waters but which Cyprus claims as its EEZ.

A second driver is Erdogan's and his supporters' growing ambitions for Turkey even as his domestic support declines. "Turkey has claimed a so-called Blue Homeland under Erdogan, ranging across half of the East Mediterranean, including the continental shelves of Cyprus, Rhodes, Kastellorizo, Karpathos, Kassos and the eastern section of Crete." While Turkey wants to explore for energy itself in what it alone claims are the TRNC's "sovereign waters" and its continental shelf, the larger issue is Turkey's ambition to pose as a major regional power from Europe to the Middle East that can act unilaterally and forcefully with impunity. Consequently, this latest announcement of drilling apparently represents a response not only to the US's heightened determination to bring Eastern Mediterranean gas to European markets, but also to deflect domestic opinion away from Erdogan's efforts to countermand the election in Istanbul in April 2019 that went against him and led to the plunging of the Turkish Lira. Since Erdogan has become increasingly beholden to Turkish nationalists in order to stay in power, an assertive, even neo-imperial policy claiming to defend aggrieved nationalist interests against Cyprus naturally plays to this audience.

Another possible motive behind the decision to drill rather than merely threaten is connected with Turkey's gas purchases from Russia. Such purchases have measurably declined during 2019. US, Qatari, and Algerian LNG, among other producers' gas, were more competitive in this market in early 2019. While we do not know why this happened, it could represent a cooling of ties with Moscow or it is a result of Turkey's severe economic crisis that has caused the Lira's de facto depreciation and its expected formal depreciation that, in turn, drives falling energy

demand. It could also be a result of price differentials as Gazprom Ekspor earlier this year revoked discounts it had given to private Turkish gas importers in 2015. Indeed, those discounts have long been a sore point in Russo-Turkish relations. So there may be real tensions in the bilateral energy ties to Moscow.

## Some Repercussions

Turkey's drilling challenge contains several potential repercussions that go far beyond Cyprus. Turkey may have acted to prevent Cyprus's submission of its EEZ to the UN from coming into effect and receiving international legal status and to

Photo: MoD Turkey



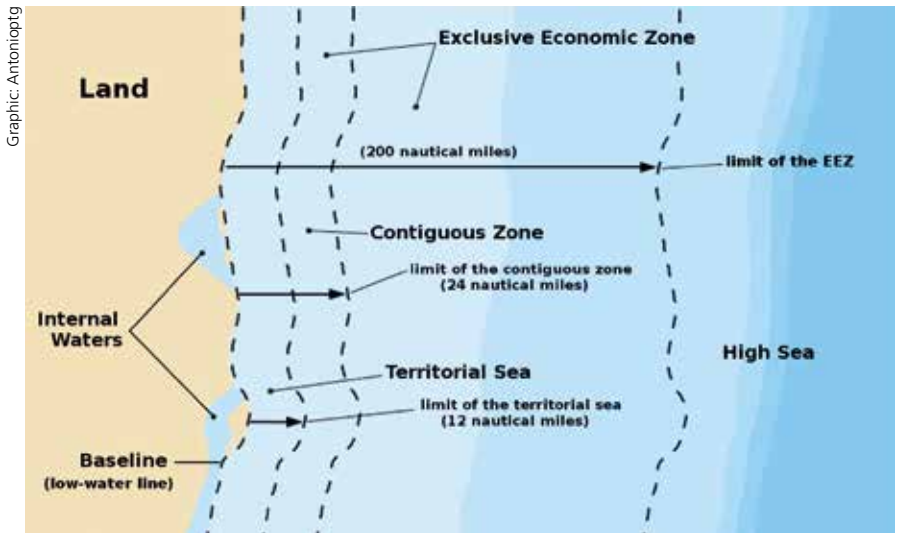
***In March 2019, the Turkish Navy carried out massive exercises under the name 'Blue Homeland', This is not only an exercise code name, but also a geopolitical concept demonstrating Ankara's agenda for the next decade.***

If this is true, this factor is undermining those ties that had become so close under Putin and Erdogan. One pillar of Russo-Turkish ties is the very close economic and energy connections that have developed over the last generation. Any erosion of such ties could have more than purely economic repercussions. During the improvement of Turco-Russian relations, Turkey's determination to play a major economic, energy (as a hub) and political role in its neighbourhood has led it to resent US efforts, which it perceives as attempts to restrict its regional economic and political influence and has led it closer to Russia who shares its anti-US resentments and political and economic ambitions. Already by 2010, analysts could argue that, "Given that Russia has abundant hydrocarbon resources to export to Western markets and Turkey with its pledge to become a regional energy hub is more than willing to transport those resources, the degree of Russian-Turkish economic cooperation will determine the future shape of the emerging Eurasian economic space."

Thus, this new intervention might be connected to this aforementioned decline in Russian gas imports.

forestall UN Secretary General Guterres' pursuit of renewed negotiations over Cyprus. Here it is worth noting the comments by Cyprus Natural Hydrocarbons Company CEO, Charles Ellinas, "Whatever the reasons, this is a massive provocation that can destabilise the region. By doing this Turkey is trying to enforce its own interpretation of what constitutes its exclusive economic zone and what it defines as its 'legal rights' in the East Med, ignoring UNCLOS (United Nations Convention on the Law of the Sea) – this claim is independent of the Cyprus problem. Cyprus is using all means available to it to respond to this, but may be unable to stop it," Ellinas argued, adding that it is important, with strong international help, to find a way to achieve a longer-term resolution of these problems, including the Cyprus problem. Ellinas further speculated that Turkey may choose to escalate the stakes by following this by drilling in areas it claims within Cyprus' declared EEZ. "In addition, what happens if it actually makes a hydrocarbon discovery? Turkey is clearly trying to create a fait accompli with potentially immense consequences," he said. While Ellinas opined that Turkey's actions would not block Cy-





**In May 2019, Turkey began drilling for gas and oil in Cyprus' EEZ. The sea areas are defined by the United Nations Convention on the Law of the Sea (UNCLOS).**



**Discussions on the construction of a gas pipeline in the Eastern Mediterranean have caused discontent in Turkey, and Turkey's coercive policy towards Cyprus has led producers to exclude a Turkish pipeline.**

and between Europe and Turkey, and with the US will continue and probably grow, not least due to this exclusion. Therefore, Turco-Russian challenges to global order and in response to the discovery of large-scale gas deposits by Israel, Cyprus, Egypt and Lebanon have also stimulated an international and increased attention to the deployment of military instruments of power in the Eastern Mediterranean, even as investors now see more promise in Eastern Mediterranean gas and the great powers' as well as regional players' rivalries over the exploitation of that gas become sharper. Finally, Turkey's challenge could easily escalate into an armed conflict with Cy-

prus and Greece. Thus, energy and hard security issues are becoming commingled and inextricable in this part of the world and not only for Greece, Cyprus and Turkey and the other producers – Lebanon, Egypt, and Israel. Obviously, any struggles involving them immediately raise profound questions for European security and for the global maritime order as well. Indeed, the tensions roiling the waters of US-Turkish relations are for the most part well known. As a recent article on bilateral relations notes, "The US is concerned about Turkey's stubbornness in buying the S-400 air defence system from Russia, Ankara's aversion to Washington's Syrian Kurdish allies, Turkey's efforts to

help Iran avoid sanctions, and Turkey's increasingly repressive policies." Hence, Turkey's behaviour on this set of issues, Syria, and most notably, the acquisition of the Russian S-400 air defence missile has already provoked US economic strikes and threats of sanctions and Turkey could also easily find itself at war in Syria with the Kurds and other minorities. Other writers claim that Turkey is also trying to islamise the Turkish Republic of North Cyprus (TRNC) converting the conflict between the two Cypriot states into a religious one and bringing about a *de facto* and *de jure* partition of the island into two states where it will have a dominant influence on the TRNC and constitute a perpetual threat to Cyprus and obstacle to its exploration of offshore energy deposits. Moreover, Turkey's actions constitute a threat not only to Cyprus but to all the other producers and potential consumers like Greece, for Turkey wants to force them either to desist from exploration or to use its threat of force to compel them to include Turkey on terms favourable to it in the shipment of this gas. In other words, Turkey's policies here resemble the classic protection racket that, if you do not heed my wishes, bad and coercive things will happen to you.

This tactic is also a hallmark of Russian foreign and energy policy. And to the extent that progress on bringing Eastern Mediterranean gas to market is obstructed, Moscow benefits even more than Ankara. Moreover, Turkey's actions contribute to and intensify the linkage of hard security policies to issues of energy security in this part of the world. Therefore, it probably is also not coincidental that this sequence of tactics mimics Russia's *modus operandi*. This is because Russia also is trying to insert itself into leveraging these gas deposits to enhance its influence over both the Middle East and Europe. Consequently, this maritime zone has now become an increasingly militarised one even before Turkey's latest probe. In the final analysis, Turkey's threats are not only aimed at its local rivals and energy producers, it also attacks the so-called rules-based order as embodied in UNCLOS. Turkey's resort to blackmail and force cannot but encourage other maritime actors to behave similarly. Until Turkey's challenge is surmounted, it also blocks European energy alternatives to Russian gas from materialising. Turkey's challenge is, therefore, not merely a regional one but a challenge to the very notion of an international maritime order and must be recognised as such lest others follow it and make even worse inroads into that order.



# Viewpoint from Berlin



Photo: Wolfgang Labuhn

## New Minister, Old Problems

**Wolfgang Labuhn**

Replacing the former German defence minister Ursula von der Leyen after her election by the European Parliament as new president of the European Commission was considered difficult by observers in Berlin. To everyone's surprise Chancellor An-

gela Merkel chose none of the defence experts in her own party but opted for Annegret Kramp-Karrenbauer, a former prime minister of the small Federal State Saarland who was virtually unknown outside Germany. Her new job is probably the toughest in German politics, with ministers rarely staying longer than one legislative period. During her comparatively long time in office, Ursula von der Leyen also became one of the least popular members of Merkel's cabinet when she was in charge of Germany's armed forces (Bundeswehr). Her insensitive handling of a few minor cases of right-wing extremism among soldiers did not go down well with her generals. The Bundeswehr has been underfunded, understaffed, and underequipped for decades. Procurement of new weapon systems has usually been a lengthy and cumbersome process often accompanied by financial scandals. The recruitment of new personnel following the suspension of conscription in Germany in 2011 has proved to be more difficult than expected.

### A Major Turnaround

All of this was more or less tolerated as long as the main purpose of Bundeswehr after the end of the Cold War appeared to be joining peace keeping missions under the auspices of the United Nations apart from supporting civil agencies at times of natural disasters like floodings or severe winters back home. All of this suddenly changed after the Russian annexation of Crimea in 2014, and Russia's support for separatists in eastern Ukraine. Following the swift reaction of NATO at the Wales summit in 2014, in its 2016 White Paper on defence Germany, too, rediscovered territorial and alliance defence against a military attack as the most important task of the Bundeswehr. The most ambitious aim now is to set up at least eight fully equipped armoured brigades under the command of three army divisions by 2031. To master this formidable task former defence minister von der Leyen pronounced material, financial, and personnel "turnarounds" that are slowly taking effect. Most importantly the German defence budget has been growing again to €43.2Bn this year compared to a meagre €32.4Bn in 2014.

It is now the new defence minister's job to make her predecessor's "turnarounds" a success story. Whether Annegret Kramp-Karrenbauer is up to this formidable task remains to be seen. Last year,

members of the Christian Democratic Union (CDU) party narrowly elected her as their new leader after Angela Merkel had stepped down from this post. Merkel might well be grooming Kramp-Karrenbauer to become Germany's next chancellor as well when she leaves office in 2021. But this will depend on how successful Kramp-Karrenbauer now manages to rebuild the Bundeswehr along the lines drawn by Ursula von der Leyen.

### Rebuilding the German Bundeswehr

In her first public statements, the new defence minister confirmed NATO's aim to spend 2% of GDP on defence. She also firmly reiterated Merkel's and von der Leyen's commitment for Germany to spend 1,5% of GDP on defence by 2024. But this will wholly depend on the goodwill of the Social Democrats (SPD) being Merkel's coalition partners in the present Berlin government. The SPD has suffered heavy losses in recent elections and now favours costly social reforms rather than additional spending on defence. The current federal budget planning by finance minister Olaf Scholz who is a leading member of the SPD aims at a defence budget of €44,9Bn. in 2020 equaling 1,37% of the projected GDP. However, after that, the planned defence spending is to be reduced again to €43,97Bn. in 2023. This amount would fall even shorter of the 1,5% of GDP promised by the current government and would be a far cry from NATO's 2% goal. But by 2023 Chancellor Merkel and her present coalition government will no longer be in office.

This might explain the German government's optimistic outlook on defence planning as outlined by the defence ministry on 27th June, 2019. According to this official statement a number of major procurement projects are now securely financed including at least 40 new heavy-lift helicopters, at least 4 new multi-purpose combat ships (MKS 180), the European MALE RPAS ("Eurodrone"), a second tranche of 210 PUMA Infantry Fighting Vehicles (IFV), and 33 new EUROFIGHTER combat planes to replace the first tranche delivered to the German Luftwaffe. But the German parliament has yet to approve these plans with the survival of the present coalition government until the next regular election in 2021 increasingly in doubt. At the same time, planners at the German defence ministry apparently estimated the additional funding needed for all projected programs until 2024 at a staggering €33 Bn.

Meanwhile, the Bundeswehr is struggling even to meet its commitment to lead NATO's Very High Readiness Joint Task Force (Land) in 2023 with a fully equipped armoured infantry brigade that is no longer dependent on material from other army units. The brigade chosen to lead the VJTF (L) 2023 is still using MARDER tanks from the 1970s that probably will not have been replaced by modern PUMA tanks by 2023 as promised to NATO. The new German defence minister will have many opportunities to prove herself.

# NATO's Strategy Towards the Black Sea Region

**Eugene Kogan**

The NATO Black Sea littoral states (with the exception of Romania) lack a coherent and convergent policy towards NATO's adversary – the Russian Federation. The policies of two out of three NATO Member States (excluding Romania) lack cohesion, sharpness and understanding of what needs to be done in order to deter an aggressive Russia. Therefore, steps need to be taken to convince the Bulgarian and Turkish governments to change their positions in the Black Sea region. Without a unified position, supported by NATO solidarity, Russia will remain the only beneficiary.

Although the pursuit of compromises and negotiations with Russia are the unwritten rule for countries such as Bulgaria and Turkey, such pursuits damage NATO as a whole. Bulgaria, Romania and Turkey remind us of the famous fable 'Swan, Pike and Crawfish'- by Ivan Krylov: "When partners can't agree their dealings come to a naught and trouble is their labour's only fruit," while the adversary Russia is joyfully rubbing its hands and laughing behind NATO's back.

gically important region. If one thinks that the pursuit of such a strategy is going to lead to a clearly articulated NATO strategy in the region, then one is mistaken. This is not going to happen anytime soon as NATO littoral states have still to find a unified position. Although it strives to find a common position, NATO as an organisation cannot force its members to achieve unity and enhance their co-operation. As a result, Romanian President Klaus Iohannis stated

dialogue with Russia "from a position of strength." However, both statements have become a mantra lacking real substance. Whatever NATO is capable to offer as a unified policy line is no match to what Russia is capable to counter militarily, namely, swift and robust military action. At the same time, it should be remembered that NATO operates under severe constraints. It has to do everything by consensus, and there are sharply divergent views among the allies

Photo: US Navy



***Ships from participating nations are in formation during exercise Sea Breeze 2011. Sea Breeze is the largest multi-national maritime exercise in the Black Sea region.***

As a result of the divergent policy, NATO as a whole continues to struggle to find a common and credible policy for this strate-

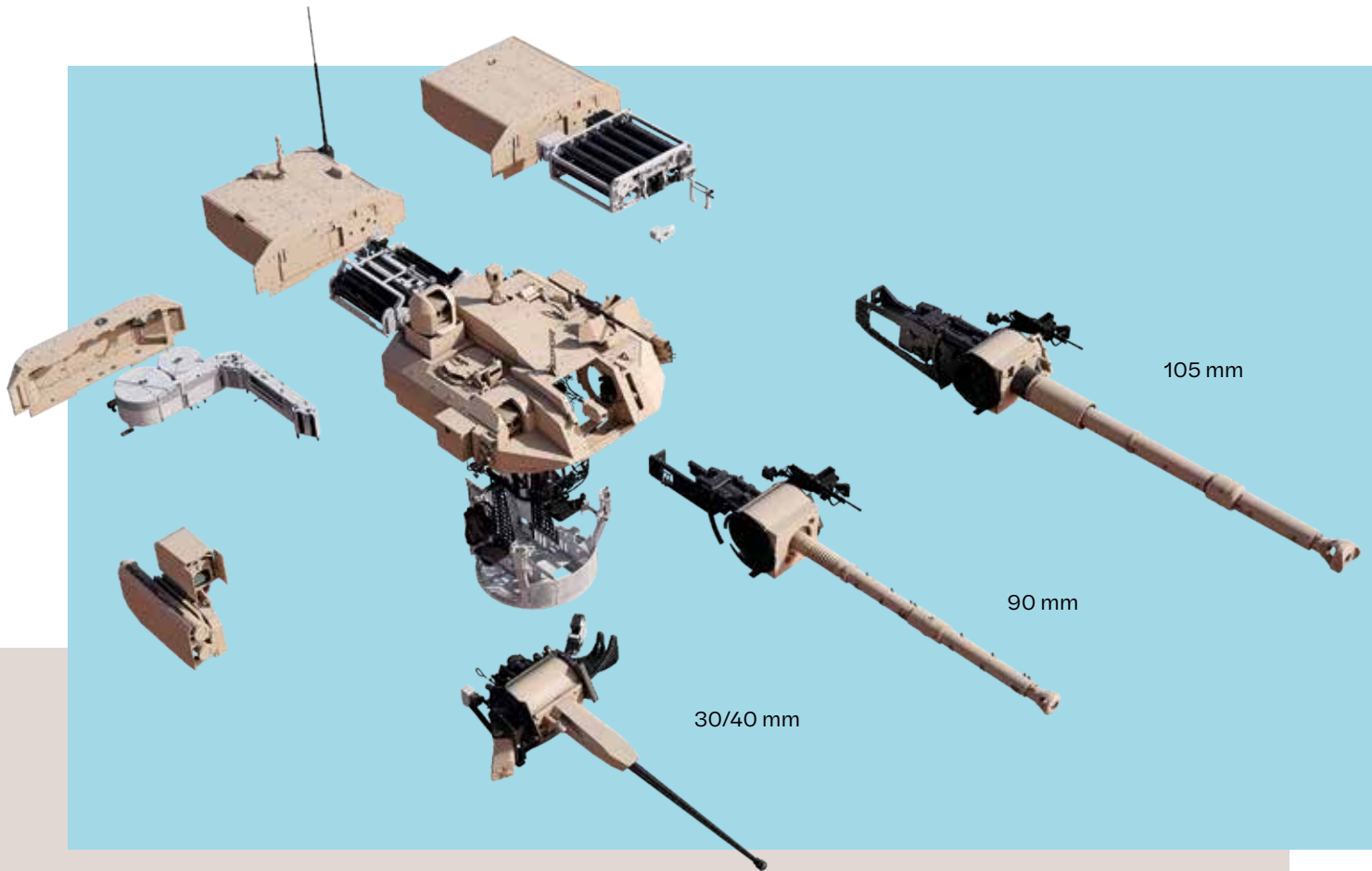
## Author

**Eugene Kogan** is a defence and security expert based in Tbilisi, Georgia.

in October 2017 that "We are not threat to Russia. But we need dialogue from a strong position of defence and discouragement". While this statement is fine, it nevertheless lacks any specifics relating to the common position and policy. The same can be said of NATO Secretary General Jens Stoltenberg, who said in January 2017 that the alliance and the new US administration under President Donald Trump agreed on the need for

over how to react to Russia. Russia has an advantage since President Vladimir Putin and his military advisers can decide everything on the spur of the moment (with the plans prepared well in advance) and launch military operations without any prior warning. A balanced NATO presence in the Black Sea region neither convinces nor deters Russia from further encroachments in the region. NATO solidarity is indeed im-

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portant but again it does not scare Russia and its leadership since the latter understands the nature of brute force better than NATO and knows how to use brute force to its best advantage. In other words, NATO must be prepared militarily at any time for any potential Russian operation in the re-

President Klaus Iohannis in October 2017 that “the brigade in Romania is only a part of our answer to the increased Russian presence in the Black Sea. However, it would send a message that an attack against a member of NATO will be treated as an attack against all allies.”

as more allied visits to Romanian and Bulgarian ports. However, this is not enough. NATO must encourage the air, ground, and naval component in both countries to join forces on a bilateral basis reinforced by a US presence on the ground. It is clear that the Bulgarian government is likely to oppose such an effort since it does not wish to irritate Russia. Krassimir Karakachanov, the Bulgarian Deputy Prime Minister and Minister of Defence, said in March 2019 “I am convinced that between Europe and Russia, between NATO and Russia, it is necessary to look for a path – for a peaceful resolution of the problems.” This statement is shared and supported by Boyko Borissov, the Bulgarian Prime Minister, who said in early March 2019 that “He has always been against military activities next to the shore of Bulgaria, except for military exercises.” The questions that remain to be answered are: if a peaceful resolution cannot be achieved, what then? Both options are unattractive but in the real-world deterrence does not always work.

The US and other NATO allies have to find a way to convince the Bulgarian government that increased co-operation will help to reinforce NATO cohesion and ability to operate bilaterally and multilaterally. Other options namely, NATO temporarily reflagging ships from non-Black Sea navies under the flags of Bulgaria and Romania was flatly rejected by Bulgaria in 2016 and since then the Bulgarian government has not changed its position. Besides, Karakachanov, said in March 2019 that “Bulgaria has no plans to have naval NATO bases on its territory.” Thus, changing the mindset and attitude of Bulgarian officials remains a main challenge for NATO as well as challenge to the security of NATO operations in the Black Sea. Even though the Supreme Allied Commander Europe of NATO Allied Command Operations, Curtis Scaparrotti, said in March 2019: “the Russians do not like our presence in the Black Sea, but these are international waters, and our ships should go there, and our planes should fly” unobstructed and all NATO members should support such efforts, the reality is different. NATO’s motto ‘All for One and One for All’ appears to be fragile despite Stoltenberg saying “that an attack against a member of NATO will be treated as an attack against all allies.”

However, even without these challenges, NATO needs to develop a coherent contingency plan for Black Sea maritime operations. That is why now is the right time to prepare a detailed analysis to exercise both sea control and air power projections across the region that also involves Georgia and Ukraine, countries that aspire to become

Photo: USMC



**A US Marine with Rotational Force-Europe fires an M240B machine gun during “Sea Breeze 19” in Chabanka, Ukraine, 3 July 2019. “Sea Breeze” is a US and Ukraine co-hosted multinational exercise held in the Black Sea region and is designed to enhance interoperability.**

gion against NATO Member States, even if such a probability appears low or some may even say remote. However, the illegal Russian annexation of the Crimea was one example of this happening. Therefore, we cannot ignore potential Russian military action in this region against NATO members and Russia will, as usual, deny any such action and present itself as a victim of any NATO initiated attack. However, it should be emphasised that after Crimea everything has changed and everything inconceivable has now become conceivable. The end result of the annexation of the Crimea led to a belated awakening and understanding in the NATO leadership that something needed to be done to change the situation. This resulted in the acceleration of NATO’s dormant engagement in the region as described below. The first step in the direction of NATO solidarity as a policy line was made in October 2017 when NATO inaugurated a new brigade-size multi-national NATO force with headquarters in Craiova, Romania, which was designed to counter Russia’s increased threat to South-East Europe following the illegal Russian annexation of the Crimea and continued intervention in east Ukraine. NATO Secretary General Jens Stoltenberg told a joint press conference with Romanian

NATO’s Black Sea Forces in Craiova will initially have about 4,000 Romanian soldiers, although it is yet unclear whether the initial contingent of troops will increase. The initial contingent is to be supported by forces from nine other Member States, including Bulgaria, Canada, Germany, Italy, Poland, Portugal and the US with some 900 troops – although not Turkey, the country that has been drifting from the alliance for some time.

Turkey favours a rather limited NATO presence in the region that does not infringe on Turkey’s interpretation of the Montreux Convention, which restricts the passage of non-Black Sea navies through the Bosphorus Straits. The non-Black Sea navies are permitted to stay in the Black Sea for no longer than 21 days. And a less restricted stay in the Black Sea would principally change the balance of power in favour of NATO. At this point, NATO has been unable to persuade the Turkish government to change its position because relations with the rest of NATO remains tense. Turkey sticks to its strict interpretation of the Montreux Convention, a position also shared by Russia.

In addition to a land-based brigade-size NATO force in Craiova, NATO’s Black Sea maritime presence already includes naval patrols, naval training and exercises as well





Photo: US Navy

**Screen capture from video of a Su-27 conducting an unsafe intercept of a Navy EP-3E ARIES II over the Black Sea on 5 November 2018.**

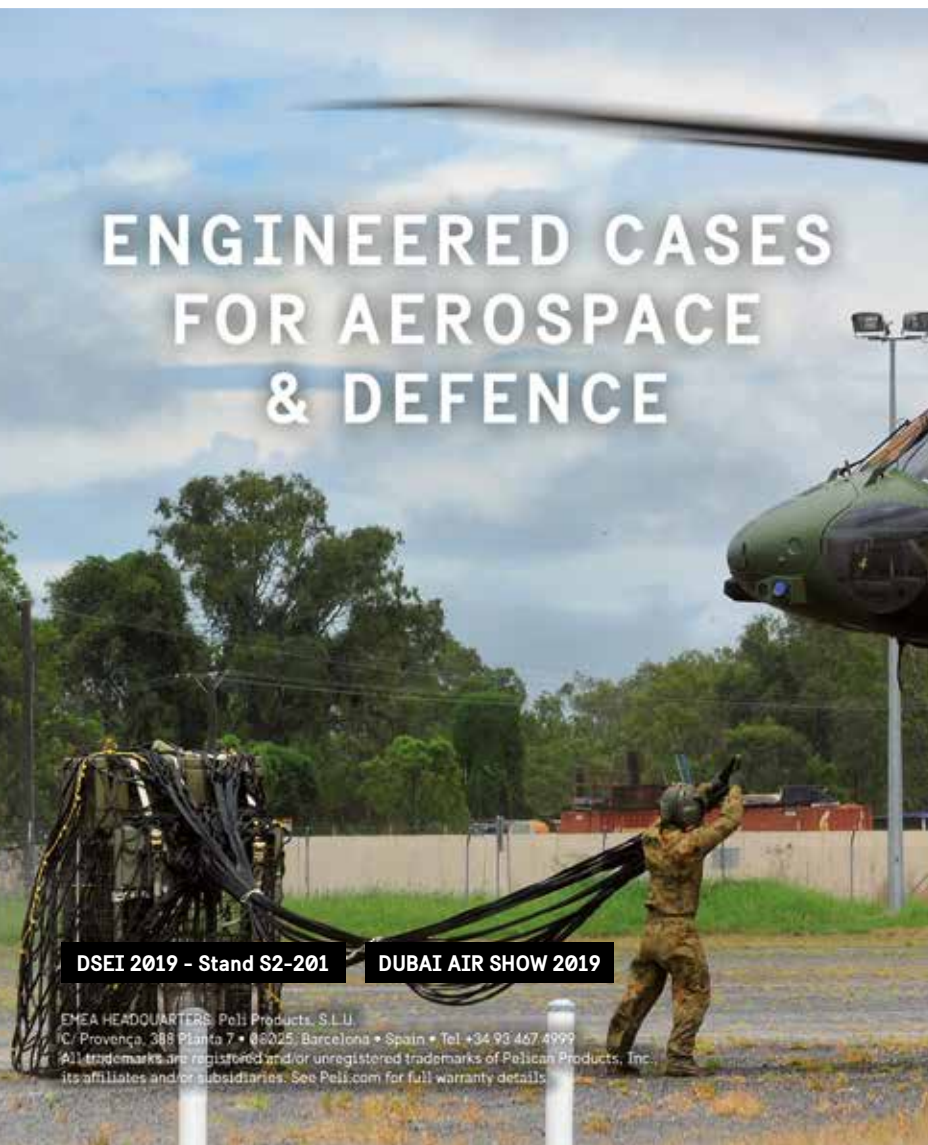
NATO members, even if both countries have currently limited military capabilities. Finally, the air component structure is reinforced by four UK Eurofighter TYPHOON aircraft that sends an explicit message that despite the referendum to leave the EU, the UK remains committed to NATO. Canada is already patrolling Romanian airspace with F-18 combat aircraft along with national pilots, while Italy is patrolling Bulgarian airspace from the Graf Ignatievo Air Base with Eurofighter TYPHOON.

To conclude, NATO's current response is based on actively engaging its key allies in the region, each with their own strategic capabilities. However, it should be emphasised that Bulgarian strategic capacities are limited and are not yet fully modernised. It will take a while for Bulgaria to develop the needed strategic capabilities. In contrast, while the Romanian Air Force is in a better shape although the same cannot be said about the country's naval capacities that are not yet in a good shape. Due to a disa-

greement between contenders for the Romanian multi-functional corvettes project, Romania may not have the first corvette by 2022 as previously envisaged. Turkey's strategic capabilities in the Black Sea are also limited since Turkey does not consider Black Sea its prime area of operations. The Aegean and the Mediterranean Seas are the principal Turkish 'theatres of naval operations' and Turkey is involved there.

Bilateral and trilateral air, ground and naval exercises of the NATO Black Sea Member States should not just be supported but also actively pursued. If NATO wishes to pursue an assertive policy in the region, it should convince the Bulgarian, Romanian and Turkish military to co-operate more closely. This is a challenge that NATO needs to tackle.

NATO as a whole needs to rely on the Naval Striking and Support Forces NATO based in Oeiras, Portugal – a naval force that is based not in the vicinity of the Black Sea region. As a result, NATO has concerns in its overall capacity to handle a potential crisis in the region should one occur. Therefore, NATO's policy and strategy in the region requires further clarity, which hopefully NATO policymakers realise and are ready to do something about sooner rather than later. ■



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# “They called us Russophobes, but unfortunately we were right”



Photo: Alfredas Pladis / MoD Lithuania

**Lithuania has long been exposed to Russia's aggressive behaviour and has also been a victim of Russian cyber attacks. ESD had the opportunity to talk to Raimundas Karoblis, Minister of Defence of the Republic of Lithuania.**

**ESD:** What is your perception of the Russian threat? Is NATO doing enough?

**Karoblis:** Regarding the Russian threat, it is clear that the situation we have been facing since 2014 is not changing. It is escalating even further. Specifically, Russia has illegally annexed Crimea and is continuing its aggressive posture in Donbas. The Russian military potential in the region remains about the same, and there is no hope that Russia could change the situation for the better.

A new page in the situation was Russia's aggression in the Strait of Kerch. That was really a brazen demonstration of force. It was the first time that Russia had shown its true colours when it was directly involved in the heinous attacks against the peaceful naval ships of Ukraine.

Well, are we all doing enough? My personal question is “Where are the red lines?” Do we have to put up with the Russian behaviour and further tolerate their attacks?

I was ambassador to the European Union in 2014, and I was probably the first EU ambassador to inform the EU authorities of the Russian side using tanks, other weapons in Ukraine's Donbas. It was in July. One EU official wondered what could follow next, what our response could be. He said we had to establish red lines and see what the Russian reaction would be. We did impose sanctions on Russia but stopped short of setting up red lines. It was the issue in 2014. Red lines were not established at all. Therefore, I believe more solidarity is necessary. The perception of threats among the NATO allies is different. Being members of a multinational alliance, we have to settle disputes by mu-

tual concession, that is, we always need to find a compromise.

**ESD:** What are the lessons learned from the Enhanced Forward Presence and Baltic Air Control?

**Karoblis:** Enhanced Forward Presence is really working, and working very well. It is really a demonstration of solidarity. Of course, keeping in mind Russia's aggression in Ukraine, it was obvious that Russia was not going to implement its international obligations; it doesn't respect independence, sovereignty or territorial integrity of other

countries. We are glad that NATO and the EU are well aware of where the real threats come from.

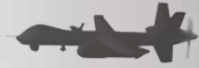
Lithuania was raising the issue of Russian threats. They called us Russophobes but unfortunately, we were right. Enhanced Forward Presence is one of the mechanisms we have. Because of the presence of NATO forces, of the solidarity among the member-states, any aggressor should think twice before attempting to launch an attack against the country in which NATO troops are stationed. NATO allies from the Baltic states are happy as they enjoy solidarity of other

Photo: USMC / Antonio Garcia



**Service members from several NATO countries demonstrated their amphibious capabilities in preparation for "Baltic Operations" (BALTOPS) 2019 in Palanga, Lithuania, 15 June 2019.**

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countries and have an opportunity to test the level of combat training of their units. Our objective is deterrence.

**ESD:** What are the key modernisation projects of the Lithuanian Armed Forces?

**Karoblis:** If you take the issue of modernisation seriously, you need a lot of money. It was the first time last year that we reached 2% of GDP. It was not easy. We have already discussed political issues and lines of development and decided to bring the level of military expenditure to 2.07% of GDP.

special operations forces. Now we focus our attention on the helicopter units. Well, this direction is about 30% complete. Therefore, our main directions include modernisation of our forces, raising the firepower, the manoeuvrability of our forces, and enhancing their reconnaissance capabilities. In addition, we develop programmes related to the motivation of the service personnel. We have made a substantial progress in our efforts to modernise our armed forces, to equip them with modern armament, and so forth. We will continue investing in arma-

disinformation, cyber-attacks, or attacks against critical infrastructure – threats against which NATO today has a relatively limited toolbox. Of course, we should support these initiatives. For example, we are interested in military mobility. It is about the speed issues related to NATO, such as decision-making speed and high mobility. The idea is good. However, the border crossing procedures for military units are a very sensitive issue from the standpoint of security. We need to resolve it.

Another example, which I believe is important, is cybersecurity. Cybersecurity is the domain where we need to be together. We need collective efforts in sharing experience and defending our interests together. This project is one of the latest achievements we have gained on a practical basis.

There are other issues of importance. We must work together in the field of logistics, military medicine, and so on. Of course, it should be about doing good deeds, not the words alone.

The second issue is the openness of PESCO projects to third countries. It is ok with the EU, but what about our partners in the European economic zone, Norway, for example? In addition, of course, we have our partners in the East – Ukraine, Georgia, Moldova. So, should these projects be open for these countries, too? These challenges must be discussed in the EU. I think, we need to be open when confronted with such issues.

**ESD:** Does Europe need a strategic autonomy or do we have to rely on NATO as we did in the past?

**Karoblis:** I hate the theme of strategic autonomy. Maybe there are some cultural aspects but in the Lithuanian language, the term “autonomy” means autonomy from something. However, it is not about the terms, but also about substance. We do not talk about isolation. The challenges in the world are real. NATO cannot be everywhere. We need some distribution of responsibilities. For example, Africa. We have to involve the UN mechanisms. We talk about apportionment of commitments. Our area of responsibility is Europe. We could elaborate quite a lot on these mechanisms. However, we do not need a European Army. Certainly, we have the classical European battle groups. Yes, these mechanisms are quite expensive. I think we have to keep in mind that we are responsible for several parts of Europe. Therefore, it is not a strategic autonomy, not a European army but the European mechanisms of defence.

**The interview was conducted by Alex Horobets**

Photo: MoD Lithuania



**The first two of 16 self-propelled PANZERHAUBITZE 2000 howitzers were delivered to Lithuania in June 2016.**

Then, because of slow economic growth, this target was lowered to 1,98%. In summer, we succeed in allocating another €20M for the defence.

The issue of modernisation: The objective of NATO is to raise the amount of money for modernisation by 20%. We've made it 30%. It is not about the figures that look attractive, but it's because we really need that. Our biggest project now is the BOXER infantry fighting vehicle (IFV). The IFVs are to come into service with two battalions of the Mechanised Infantry Brigade to increase its battle readiness. We stress high manoeuvrability and fighting capability.

Secondly, we will buy the German Panzerhaubitze, which is one of the best in the world. In addition, we are forming an air defence battalion to be armed with the Norwegian Advanced Surface to Air Missile System (NASAMS). It will become operational soon. The NASAMS is a middle-range air defence system. Nowadays, we have only short-range anti-aircraft guns. Now we will raise the level. Of course, we will not cover the whole territory of Lithuania but the aggressor will think twice before attacking. Another direction is buying armoured vehicles for reconnaissance missions, for the

ment, in new technologies. Of course, it is costly but we have to pursue that policy. I think we will succeed.

**ESD:** What is Lithuania's participation in PESCO (Permanent Structured Cooperation)?

**Karoblis:** We have challenges in EU in general. Besides, there are disagreements between the EU and NATO member-states in terms of defence expenditures and their capabilities. It is important to emphasise that representatives of the EU exhibited a flexible understanding of EU-NATO complementarity. Representatives of the three main institutions that shaped the Lithuanian position on PESCO discussed three distinct ways in which EU defence policy could supplement the Alliance. First, it could do this directly, through projects that enhance or optimise NATO operations in Europe. Second, EU initiatives that help its member states develop their national defence capabilities would also indirectly strengthen NATO defensive capacity. Third, the EU would assist NATO role in ensuring transatlantic security through projects covering sub-conventional threats, such as

# Viewpoint from Taipei



Photo: Wendell Minnick

## Taiwanese Tug-of-War between China and the US

Wendell Minnick

In July, China's newest defence White Paper came out at a critical time not just in Beijing's relationship with the United States, but during electoral challenges for the Taiwanese presidency that defies Beijing's claims over

the island, and the unexpected uprisings in Hong Kong against the Chinese Communist Party's meddling in local politics.

Since the report, "China's National Defence in the New Era", was no doubt written long before the misadventures of Hong Kong's Carrie Lam and what appears to have become a brutal battle amongst pro-China and pro-independence parties for Taiwan's future, it can be still be assumed to be an accurate representation of Beijing's steadfast belief in a united Motherland that recognizes only one puppet master – Beijing's Chinese Communist Party. The report states that the "fight against separatists is becoming more acute" and that the pro-independence (Green) Democratic Progressive Party (DPP) "stubbornly sticks to Taiwanese independence and refuses to recognise the 1992 Consensus that embodies the one-China principle."

Unfortunately for China, pro-unification groups (Blue) have literally turned on each other after a recent Kuomintang Party (KMT) presidential primary election inflamed competing KMT egos in Kaohsiung and Taipei, resulting in at least two, possibly three, Blue candidates fighting against only one DPP presidential candidate, Tsai Ing-wen, who won her first presidential term four years ago. Should Blue ego-mania persist, Tsai is expected to win the presidency again - which will no doubt enrage Beijing.

The Chinese White Paper accuses the DPP of promoting separatism by stepping up efforts to sever the connection with the mainland in favour of gradual independence, "pushing for de jure independence, intensifying hostility and confrontation, and borrowing the strength of foreign influence [aka the United States]." Since the Trump administration entered office, relations have greatly improved between Taipei and Washington. On 8 August 2019, the US released a US\$2Bn deal for one hundred and eight M1A2T ABRAMS Main Battle Tanks and related equipment to Taiwan, and the imminent release of 66 new F-16V fighter aircraft is also expected. During the Obama White House, Beijing threatened that the sale of new F-16 fighter aircraft was a "red line", yet under Trump, little mention has been made of that threat. The "red line" was always ambiguous, but many in Taipei assumed it entailed military action of some type by China.

The new report makes no mention of US arms sales, but does state that "Taiwan independence separatist forces and their actions remain the gravest threat to peace and stability in the Taiwanese Strait,

and the biggest barrier hindering peaceful reunification of the country."

The White Paper has come out also at an awkward time for US-Taiwan arms sales. The biennial Taipei Aerospace & Defense Technology Exhibition (TADTE), slated for 15-18 August, will feature US defence companies plying their wares despite China's sabre-rattling and threats to financially punish those same companies. For the first time in TADTE history, BAE Systems will have a booth at this show.

"China must be and will be united." According to the report, this means by force, if necessary, with all options on the table. "The People's Liberation Army will resolutely defeat anyone attempting to separate Taiwan from China and will safeguard national unity at all costs."

So what does this mean for Taiwan if Blue implodes in this presidential cycle and Green wins again? Having lived in Taipei for 22 years, in my opinion four more years under a pro-independence government might force Beijing's ageing president, Xi Jinping, to push forward on his promise to give Taiwan until 2020, thus emblazoning his name in China's history books as its greatest leader in modern history.

Does this mean war in 2020? No, but it does mean is that the clock is ticking. The report clearly reminds the reader that in aiming at safeguarding national unity, China's armed forces have already begun strengthening military preparedness with an emphasis on the sea. "By sailing ships and flying aircraft around Taiwan, the armed forces send a stern warning to Taiwanese separatist forces." It could mean that by the end of President Tsai's tenure in 2024 she could face a firing squad of Chinese soldiers after a horrific invasion, if Taiwan's military, including its new fighter aircraft, fails to live up to expectations.



Photo: Wikipedia

**A guard of honour at Chiang Kai-shek Memorial Hall in Taipei**

**Wendell Minnick is a lifelong specialist in Asian affairs, and Editor of China In Arms.**

# ISIS's Calculated Defeat and the Threat for Europe

**Andreea Stoian Karadeli**

Back to the old ashes that provided the roots for ISIS, the terrorist organisation easily transformed the defeat and loss of territory in Syria and Iraq into an opportunity to get back to an updated version of its previous form – a dispersed network of transnational terror with a fluid and asymmetric strategy – harder to locate, control or fight against.

ISIS 2.0 is the reiteration of an insurgency that has now gone global and relies on known and unknown members and sympathisers worldwide, motivated by the stronger and ever-lasting narratives of the 'Virtual Caliphate'. Although the Global Coalition against ISIS celebrated its victory, the threat represented by the new form of ISIS, also addressed as ISIS 2.0, should not be underestimated. Narrowing the assessment from the global scale to Europe, this article discusses the threat represented by ISIS 2.0 to European countries.

## Global Expansion

Starting from the roots of the organisation in Iraq, ISIS has evolved internationally, marking its presence around the globe. 'Wilayat Khorasan'/'Khorasan Province' became 'ISIS-K' in Afghanistan, while collaboration between ISIS and Abu Sayyaf and the Philippine Maute Group shows a new strategic partnership in the region. The insurgency focuses on global expansion, raising the challenge of an ISIS 2.0, despite the loss of control over territories in Syria and Iraq. This strategy is not new with many recordings of ISIS's collaboration with regional terrorist groups worldwide being released long before its defeat. Although usually known for short-term planning and

Photo: US Army



**During Operation Inherent Resolve, US Army paratroopers fire an M777 155mm howitzer in support of Iraqi forces in northern Iraq in 2017.**

impulsivity in achieving its aims, ISIS has proved its long-term predictive capabilities through the creation of a global back-up network that is now useful after the collapse of the physical 'Caliphate'. Returning to the old insurgency tactics has allowed ISIS to enter both well-protected territories and areas where they can manipulate already existing conflicts. Previous attacks in these regions through conventional combat units have failed even though the group was at the peak of its power. As such, 'hit-and-run' attacks, promoted through ISIS propaganda, aim to provide evidence that the organisation still exists and is untouchable despite their territorial loss. Moreover, ISIS has proved adaptable, with strong powers in foresight and extraordinary manipulative capacities

in structuring its strategy according to the status that best suits the organisation – a clandestine terrorist network with global ramifications. In order to understand and fight the group, a better look into its origins together with an assessment of its recent activity is necessary.

## ISIS 2.0 / Global Jihad 3.0

To begin with, the result of ISIS's transformation is mirrored by its attacks worldwide as they have evolved and become geographically dispersed. This fact can be visualised through the world maps of ISIS attacks during the same period of the year (1 January to 15 July) over the last four years. As early as 2017, the organisation's tendency to drive or claim more dispersed

## Author

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Photo: Thierry Ehrmann

**Graffiti left by ISIS sympathisers in Lyon, France**

attacks can be observed in the shift from high-impact attacks, centralised in one region, to low-impact attacks, conducted in diverse locations. The maps provided by ESRI terrorism database prove that, as an insurgency, ISIS has the potential to represent a danger at least as high as it was during the period of the self-proclaimed 'Caliphate' in Iraq and Syria. Its global ramifications are extremely difficult to trace and locate; the sympathisers, recruits, the ' sleeper cells ' and even the foreign terrorist fighters that escaped the war in Syria can now be anywhere without security services being able to identify them in a timely manner.

Between 1 January and 15 July in the past four years, the number of attacks has increased (in 2016 – 278 attacks, 2017 – 279 attacks, 2018 – 237 attacks, and 2019 – 323 attacks), although the number of fatalities dropped to less than a quarter (2016 – 5,627 fatalities, 2017 – 2,096 fatalities, 2018 – 1,587 fatalities, and 2019 – 1,260 fatalities). Through the 'hit-and-run' strategy, ISIS seeks to attract the attention of the international community and to prove its global presence despite its territorial defeat, claiming to be always one step ahead of the national and international security forces. The number of victims is not relevant for ISIS as the time of the 'big terrorist attacks' has long gone, although more fatalities can create more panic and give more credibility to the organisation, the importance is given to the successful performance and claim of the attack. As such, the planning of new attacks is not very rigorous, and is often left to the attacker who does not necessarily have any previous combat training and uses weapons that are easy to obtain.

At the same time, ISIS 2.0 tries to make a strong entrance through attacks made by ' sleeper cells ' infiltrated worldwide. These cells are the assets that have so far proven to be extremely dangerous and difficult to identify before carrying out any attack. This was witnessed in the April attacks in

Sri Lanka where the national authorities obtained the information regarding the existence of 'crocodile cells'/' sleeper cells ', but could not identify them in time. As such, ISIS 2.0 is not just a dispersed phenomenon, but also a global challenge that is difficult to track and/or identify, especially when intelligence is incomplete or insufficient.

The Sri Lanka attack is actually not the only one that took place on that day. A much-less-noticed attack took place in Riyadh, Saudi Arabia, but it did not succeed in causing a spectacle of mass death. However, it was nevertheless confirmed as an ISIS attack, proving that the organisation is now playing successfully on multiple fronts. The Sri Lankan and Riyadh attacks together with its dispersed violence gave ISIS 2.0 the advantage that the old organisation missed – a global profile that is no longer limited to Syria and Iraq. In fact, the international community did not listen carefully enough to understand that ISIS has been aiming towards a global profile from the very start. ISIS did not aim its appeal to just Iraqis and Syrians, but to the global Muslim community. This was very obvious through the geographical background of the 40,000 to 50,000 foreign terrorist fighters that have joined the group. ISIS provided a broad-

based view of what Islam should be that can be understood by any Muslim, whether from the Philippines, Russian Federation, Australia, Europe, Turkey or Saudi Arabia. The organisation has not suddenly become global as ISIS 2.0, it has been thinking and acting globally since they were first established.

The most important element in the strategy to defeat your enemy is to be able to act like him in order to predict the next move. The Global Coalition's success is, based on the perspective of the enemy, a calculated defeat for ISIS who manipulated the context and used it as an opportunity to get back to what they know best – transnational insurgencies. This was proven not only by its recent activity, but especially by Abu Bakr Al-Baghdadi's appearance and remarks. His video marked a new chapter for the organisation, but also the return to its first objective represented by the group's wider geographic ambitions. In the video, he bragged about new oaths of allegiance extended to him from jihadist groups in Mali, Burkina Faso, Afghanistan, and Sri Lanka. The video ends with footage showing him being briefed about various foreign franchises, including a new one in Turkey. As a subliminal message, his words can be translated as follows: "Your countries' victory and the Caliphate's defeat actually made my organisation stronger and transformed it into a bigger threat".

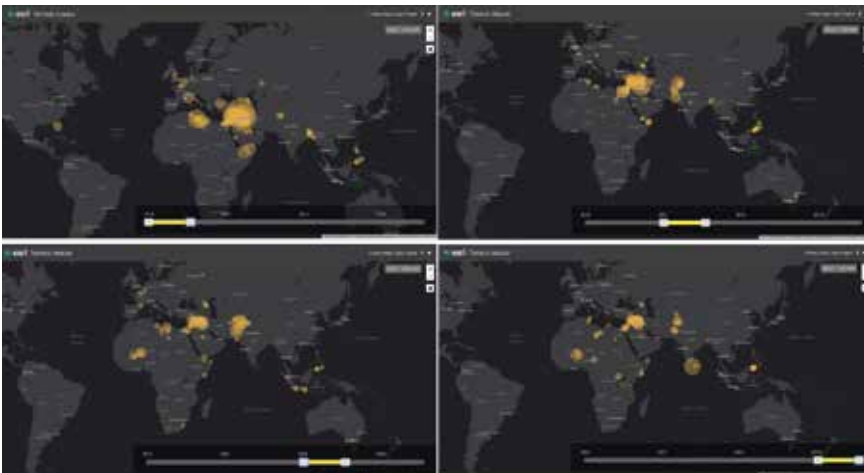
Moreover, before we narrow the assessment to the European region, there is one more issue to be raised here. The seeds of ISIS 2.0 and the foundations of a Global Jihad 3.0 are found among the prison population worldwide. Although this is not a new fact, the international community seems to refuse to note this point and act accordingly. As such, the way in which the detention of these fighters is handled in Syria and Iraq should be extremely important for the Global Coalition, while the



Photo: US State Department

**Special Envoy James F. Jeffrey addresses the Meeting of the Ministers of the Global Coalition to Defeat ISIS in Washington, D.C. in 2019.**

Source: ESRI terrorist attacks



**A visualisation of terrorist attacks from 2016 to 2019 showing the spread of violence caused by ISIS sympathisers globally.**

European prisons have become a ‘crater of radicalisation’ and a fabric of new recruits ready to take their tasks. Negating or turning a blind eye to this issue will only provide ISIS 2.0 with the necessary human infrastructure to gain further power and to plan, co-ordinate, and carry out attacks against the Global Coalition’s member states.

### ISIS 2.0 in Europe

Attacks in the West, and especially in European countries, are considered part of the ISIS 2.0 phenomenon, in order to prove resistance, inspire global followers, and motivate existing ones. Underlining even more the issue of prisons and radicalisation, the Head of Interpol Jürgen Stock declared in an interview in 2018 that Europe will soon face a second wave of terrorist attacks once ISIS supporters serving short sentences are released from detention. He described them as an “early generation” of ISIS supporters and defined the phenomenon as “ISIS 2.0”. In the same way, Europol admits that there is a continued concern regarding the individuals with a criminal background, including those currently imprisoned who are vulnerable to indoctrination and who might engage in terrorism acts after their release. Moreover, Stock has highlighted the complex and international character of ISIS, which now represents a more acute danger, highlighting the threat posed by the phenomenon of foreign terrorist fighters. Also relevant in this assessment is the detail given by Stock during his interview: in 2012, the number of ISIS profiles held by Interpol was 13, while today, the Interpol database of ISIS includes over 50,000 profiles. It is understood that these are people who experienced the war in Syria and Iraq and obtained the necessary knowledge to organise and run successful attacks, including the manufacture of improvised explosive devices.

In the same way, a German Government intelligence report from 2018 identifies a high level of danger from ISIS returnees, some of whom are already in German prisons or awaiting trials. The highest threat comes especially from the ones that are hiding and whose locations are not known by the German authorities. The German Government has admitted having completely lost track of more than 160 of the former ISIS militants, while the risk of the returnees is described by the intelligence report as a ‘heterogeneous picture’.

According to the Europol’s recently released TE-SAT 2019, 13 people were killed in terrorist attacks in the EU in 2018, marking a decrease in relation to 2017. All the attacks were jihadist in nature and committed by individuals acting alone. Following the global trend of ISIS 2.0 for individual attacks, the modus operandi implies firearms and unsophisticated, readily available weapons (e.g. knives). As emphasised before, the number of victims and fatalities is not the main target of the attacks, as long as they

are completed. The key word here for ISIS 2.0 attacks is not sophistication, but rather unpredictability.

The same report also mentions 16 foiled jihadist terrorist plots in the EU Member States, illustrating the effectiveness of counter terrorism efforts. However, the significant number of thwarted attacks proves ISIS’s continued intent to perpetrate terror attacks across the EU. Bearing in mind the general increase in online propaganda providing necessary instructions for complex attacks, several disrupted terrorist plots have included the attempted production and use of explosives and chemical/biological materials. The report of the German Government mentioned earlier revealed the first case of a jihadist-motivated production of biological weapons in Germany.

Regarding the ISIS returnees and their role in the ISIS 2.0, according to Europol, the official number of individuals returning to the EU also remained very low. Hundreds of European citizens – including women and minors, mainly of a very young age – remain in detention in the Iraqi and Syrian conflict zone. While minors are essentially victims, there are concerns among EU Member States that they have been exposed to indoctrination and training in former ISIS territories and may pose a potential future threat. Based on this assessment, the ISIS 2.0 looks rather like a generational phenomenon with long-term effects.

### The Virtual Caliphate

The ISIS phenomenon marked a shift from terrorism that used the Internet for communication and propaganda, to terrorism that surpassed Surface Web and is completely immersed in Deep Web and ‘Dark web’/‘Dark Internet’. ISIS has developed World War II propaganda campaigns that

Photo: US Air Force



**Commanding General Paul Funk of the Combined Joint Task Force – Operation Inherent Resolve talks about the effects ISIS had on the Middle East, 10 December 2018.**



are now playing in the news (such as AMAQ media coverage and global coverage), video formats (YouTube), audio recordings (audio clips and audio tweets), social networks (Facebook, Instagram, Snapchat, Twitter, Weibo), video games (ARMA 3), and social campaigns related to hashtags. While the International Coalition against ISIS has had a victory against the organisation in Syria and Iraq, they could never really combat the impact of their 'Caliphate' formation and declaration. The 'Virtual Caliphate' takes its legitimacy straight from the created precedent of reaching a level that no other jihadist organisation has reached so far.

Although it is open for us to read, watch, listen and understand, the ISIS 2.0 narratives are still hard to digest when assessed entirely through the lenses of practitioners and academics. In order to understand the strategy behind Rumiyyah, the meaning of the horrifying videos and pictures shared online, the feelings of belonging through the common ISIS hash tags and comments, security agencies in Europe need to think both like the jihadist recruiters and recruits. The main advantage used by ISIS in its world-wide radicalisation process can be summarised in one word – accessibility. There is not much needed to be done in order to become part of the 'new jihadist trend' – a video, a photo or a simple tweet can get you in the group. The same strategy gives ISIS the opportunity to take responsibility for various attacks, although they may have had, in practice, no direct relation to the perpetrators. It is a 'double-win' strategy that works even better after the collapse of the physical Caliphate and this might be where we should begin our counter-terrorism fight. We need to remember that, like al-Qaeda, ISIS has been fighting for 'hearts and minds' and, through a well-designed fantasy, it has achieved its goal. It is again, the 'hearts and minds' that should be at the core of our counter-terrorism strategy and the most affected communities should be our focus.

Another important aspect of the ongoing 'Virtual Caliphate' is the Hawala banking system that continues to be an important instrument in terrorism financing. Hawala is an informal method of money transfer based on trust and honour, operating outside the traditional banking system, whereby money is paid to a network of brokers (known as a 'hawaldars'). This 'underground banking' system relies on the specifics of the financial and interpersonal relationships and is highly adaptable to conditions of conflicts/war and economic sanctions. Therefore, conducting business through an ethnic-oriented and trust-based manner is a suitable channel

for moving and providing funding for terrorist purposes. The connections and the possibility for support from 'underground banking' to terrorist organisations is undoubtedly an important aspect, but the main purpose of existence of the "underground" financial system is their profit-oriented nature. Again, both surface and dark-web sites are used to request online donations, including virtual currencies. The most common 'crypto currency' used for terrorist purposes identified by Europol is the Bitcoin. One example of fundraising campaigns through the dark-web is the one conducted through Sadaqa Coins, a crowd-sourcing project that allegedly

potential rivals in which it operates. It is now following the same strategy through its ramifications in different corners of the globe.

In order to adequately plan the appropriate ISIS 2.0 counter-threat strategy, it is essential that the forces of the International Coalition against ISIS and especially EU Member States understand the variety of potential tactics undertaken by the group, based on its experience as an insurgency in Iraq in the past. Therefore, to effectively combat an opponent such as ISIS 2.0, a new approach needs to combine less military, and more diplomatic, social, economic, intelligence and cultural instruments. The organisation's toxic ideology can still



Photo: US DoD

**Members of the Iraqi Counter Terrorism Service present Gen. Joseph F. Dunford, Chairman of the Joint Chiefs of Staff, a flag from Bartilah, a town just outside of Mosul, recaptured by the Iraqi army from ISIS.**

supports jihadist groups in Syria. Since the areas in Africa, Middle East or Caucasian regions to which the funds have been remitted may be under control of terrorist groups, it is difficult to assess where the funds really end up.

### New Strategy, Old Threat

To understand the directions of ISIS 2.0, it is important to pay a closer look to the long-game strategy that marked its original rise. The Islamic State's history of rising from the ashes in Iraq after 2008 shapes the organisation's thinking and strategy. The current situation resembles that earlier period, but on a broader geographic scale, as a global insurgency. Since 2016, in Iraq and Syria, it has returned to the old tactics of assassinating community leaders, buying locality, and planting ' sleeper cells' to conduct underground operations not just to fight its enemies but also to empty the areas of any

affect an entire generation, so the current campaign against ISIS 2.0 should focus on counteracting their narrative. Although an ideological victory against the organisation is a much more difficult task – because anti-extremist campaigns require patience and resistance – these measures provide long-term solutions addressing the root causes of radical ideologies. Together with the ideology, its online propaganda, fertile for radicalisation, must be another important objective for the international community to counter. The organisation continues to exist and conduct its work successfully, keeping alive the memory of the Caliphate through a 'virtual Islamic Caliphate' for members all over the world. But none of this is possible without continuous funding. Therefore, apart from all the instruments mentioned above, the International Coalition against ISIS should intensify the efforts to track and stop the organisation's sources of funding. ■

# The Priorities of Poland's Foreign and Security Policy

**Michał Jarocki**

In recent years the security environment in the Central and Eastern Europe (CEE) region, especially in areas in close proximity to the Polish borders, has significantly deteriorated as a result of the crisis in the Eastern Ukraine, sparked by Ukrainian internal political turmoil and Russia's annexation of Crimea.

Actions taken by Russian Federation and Ukrainian authorities in the aftermath of the Crimea crisis, have shaken the political landscape not only in this part of Europe but throughout the whole

continent, resulting in a deterioration of political, economic and military relations between the West, represented by the EU and NATO, and Russia, forcing European countries to adapt to new geopolitical realities and modify their foreign policy goals and security strategies. Poland, as a country located on the eastern flank of EU and NATO, felt particularly endangered and decided to reconfigure its

document outlined three major foreign and security policy priorities for the near future, which included:

- enhancing NATO credibility, boosting the EU's potential, and maintaining close ties with the US;
- closer co-operation with the countries in the region, especially Romania, the Visegrad Group (V4), and Baltic and Nordic states; a pro-active Eastern policy;
- significantly bolstering Poland's defence capabilities.

The Polish defence doctrine is based on the assumption that in today's world only a handful of countries, the so called 'global' or 'regional' powers, are able to maintain sovereignty and full control over national interests on domestic and international grounds. However, developments in the last few decades, have proven that even countries like the US, until recently an unquestionable military superpower, cannot act unilaterally on the global scale and are in need of assistance from other countries.

## Multinational Co-operation

In Poland's view, maintaining a fruitful and lasting co-operation with local, regional and global partners is the 'cornerstone' of its security and defence strategy and plays a key role in keeping the country safe. Therefore, as one of the strategic goals of its foreign policy, Poland highlights the need of NATO's central role as the main pillar of Europe's military security. However, in order to keep the Alliance as the main guarantor for Poland's security, NATO has to cultivate a strong bond of solidarity between its member states and reassure those ones who feel threatened by external factors or political players, about the commitments, that other NATO-partners made to guarantee their safety and independence.

**Poland closely follows all developments in the European political and security system, especially in regard to Eastern Europe, which is a fundamental factor in preserving national security.**

continent, resulting in a deterioration of political, economic and military relations between the West, represented by the EU and NATO, and Russia, forcing European countries to adapt to new geopolitical

defence strategy. As a solid and trustworthy member state, who for many years had tried to pay its tribute to the prosperity and safety of both organisations, found it necessary to confirm security commitments of its major European and transatlantic allies in the event of any major attack to its independence.

## Poland's Defence Doctrine

A few years ago, the Polish Ministry of Foreign Affairs (MFA) published the 'Polish Foreign Policy Strategy 2017-2021'. The



Photos: Polish MoD

## Author

**Michał Jarocki** is an independent, Warsaw-based defence expert who has reported on security issues and developments from a qualified 'insider' position for many years.

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**European and transatlantic institutions, such as NATO and EU, are important for Poland's foreign policy. Preserving close ties with its major allies and maintaining a strong commitment to solidarity is crucial.**

In this regard, Polish authorities were satisfied with the outcome of recent NATO summits, especially the ones in Newport (2014) and Warsaw (2016), which led to the conclusion that the Alliance needed to re-define its security strategy and pay more attention to the countries on its Eastern flank, such as Poland and the Baltic States. As a result, the allied nations decided to boost their military presence in the CEE region through the 'Enhanced Forward Presence' initiative, which led to the formation of four multinational battlegroups in Estonia, Latvia, Lithuania and Poland as well as smaller military contingents in Bulgaria and Romania.

allied troops in Poland and the Baltic States has sent a clear signal that further attempts at undermining the European order will not be tolerated. From the Polish perspective, by launching the EFP initiative and reinforcing the Eastern flank, NATO regained its core role of an organisation providing collective defence to its member states by maintaining and strengthening mutually recognised security commitments.

In order to keep NATO's efforts in reassuring its Eastern European members about Alliance's security and defence commitments at the desired pace, Poland intends to reach a number of goals on the European and transatlantic scale, such as: ensure full im-



**NATO is not the sole pillar of Poland's defence strategy, as the country seeks to boost security co-operation between EU Member States.**

According to a NATO statement, these battle groups, led by the UK, Canada, Germany and the US respectively, are multinational, and combat-ready, demonstrating the strength of the 'transatlantic bond'. Their presence is evidence of the fact that an attack on one ally will be considered an attack on the whole Alliance. NATO's battlegroups form part of the biggest reinforcement of NATO's collective defence in a generation. In a comment to the EFP initiative, the Polish MFA stated that the presence of the first

plementation of the Newport and Warsaw NATO summit conclusions, continue measures to strengthen the eastern flank, while engaging in joint operations in the south, also in co-operation with Turkey, foster co-operation between NATO and the EU in the spirit of the Warsaw Summit Communiqué, promote a robust transatlantic relationship and a strong US presence in Europe, observe commitments on defence spending and armed forces modernisation and take part in out-of-area missions carried out by NATO.

## European Defence Co-operation

Fundamentally important as it is, NATO is not the sole attribute of Poland's defence strategy, as the country seeks to boost security co-operation between EU member states, which, in Warsaw's opinion, is best represented by the Common Security and Defence Policy (CSDP), as well as any other forms of multinational defence initiatives on the European scale. In the view of the Polish authorities, Europe has many attributes in its foreign and security policy, which might enhance the defence capabilities of its members and secure them from various types of threats, on a scale from a classic military confrontation to unconventional or hybrid security issues like terrorism or illegal immigration, which might destabilise the EU from the inside.

Poland understands that countering modern security issues, especially unconventional and hybrid ones, requires co-operation between EU Member States and commonality in the way they identify, define and solve these problems. Therefore, the Polish authorities are devoted to explaining to their European allies about various threats to the EU's security system, especially the ones originating close to its Eastern borders. Warsaw also intends to put pressure on other EU members to devote adequate resources and competencies to secure common interests.

From Poland's perspective, an efficient and successful approach to preventing or fighting a wide array of modern threats requires application of a diverse range of tools, which could be defined as 'soft' and 'hard' power. The EU as a major economic and political alliance has the ability to act as an independent and sole provider of solutions to emerging problems, especially the ones related to issues such as civil society, rule of law or industrial growth. It is also capable of operating as part of a wider, multinational task group, where its own set of tools is coupled with and enhanced by more classic, military means, provided by other global actors, like the US.

Therefore, it is in Poland's interest to keep focus on cultivating unity of the transatlantic community and to enhance co-operation between EU and NATO in facing modern and future threats, which might hamper political and economic relations between partners on both sides of the Atlantic, as well as affect independence and sovereignty of particular member states of each organisation. These threats could be identified either as the possibility of an outbreak of a classic mili-



***Good relations with the US, an unquestionable military superpower, remains a priority in Polish foreign and defence policy.***

tary conflict within the transatlantic community or in its proximity or prospect of an economy or the energy crisis at the national or international level.

### **At the Crossroads of European Relations**

Poland as a country located in a strategically important part of the continent, plays an important role in shaping the security system of Europe. Lying at the 'crossroads' of two geopolitical systems, Poland separates Western modern democracies from Eastern dysfunctional regimes dominated or influenced by Russia. Furthermore, Poland acts also as an interconnector in political and economic relations between Northern and Southern Europe, serving as a gateway to the wider Baltic Sea region as well as the Black Sea and Mediterranean markets.

As a country that has a predominant political position and decisive military strength among EU and NATO eastern-flank member states, Poland's defence strategy is a key factor in shaping the future of the European security system not just in relation to the CEE region, but the continent as a whole. Therefore, the way in which Poland perceives recent political and military developments in the region, influences decision making processes on the European and even transatlantic level.

For various historical and modern reasons, Eastern Europe, especially countries located east of Polish borders, plays a decisive role in Poland's security strategy and is one of the main factors shaping its defence and foreign policy. From a Polish standpoint, unpredictability in this part of the

world, coupled with gradually deteriorating control over the use of military forces in local conflicts, affects Poland's sense of security and endangers its independence and sovereignty.

For many years, the Polish strategy towards countries of the former Soviet bloc has been – and still is – focused on helping to implement much needed political and economic reforms, bringing them closer to the Western international standards. Therefore, Poland makes an effort to enhance awareness of major Western multinational organisations, like the EU or NATO, about the influence they might have on the Eastern European struggling democracies and the role they may play in helping former Cold War rivals in the much awaited trans-

formation of their political and economic systems and introduction of pro-European and transatlantic values.

Adoption of Western policies and values could be achieved through various diplomatic and political initiatives, such as NATO's 'Open-Door' policy or the EU's Eastern Partnership initiative, launched by Poland and Sweden. In theory, these programmes could even lead Eastern European countries to access each of the organisations, as was the case with most of the former Warsaw Pact members like Baltic States, Bulgaria, Czech Republic, Poland, Romania or Slovakia.

Poland has learnt from its own example, that accession to the EU or NATO is related to openness and willingness to adopt numerous values and rules that define each of these organisations. Therefore, as possible future member states, Eastern European countries would be obliged to meet high standards of political and economic legislation as well as changing their approach to security and law enforcement.

### **A Focus on the Political Environment**

The Polish government envisions a wide range of opportunities for co-operation with its neighbours, especially countries that hold similar views on urgent problems in the region and have the same approach to dealing with current and future challenges to their safety and prosperity. The Polish MFA points out a number of actions it might take in order to secure its interests and reach the goals of its foreign policy, such as co-operation with its closest NATO neighbours: the V4 countries, Romania,



***Modernisation of Polish Armed Forces is a prerequisite for national security. Poland's authorities invest heavily in procuring modern weapon systems.***



Under the NAREW programme, Poland intends to acquire at least 19 batteries of the short range air defence system, which will serve to protect army units while on the move, as well as stationary targets, such as bases, command centres or other infrastructure of strategic importance. NAREW is expected to use the IBCS command system, which eventually will make it interoperable with PATRIOT batteries, creating an integrated medium/short range air-and-missile defence system operating under one command structure.

Further on the list of major procurements that will have significant impact on Poland's security and defensive capabilities is the HARPIA programme, which calls for the acquisition of at least 32 5th generation multirole fighter jets. Ever since the HARPIA programme was announced, experts and commentators have tried to predict what the Polish MoD will decide in regards to the preferred future fighter platform as well as the favoured acquisition procedure.

At that time, it remains to be determined whether the MoD will continue with the procurement through an official, open tender process or through a simple selection preceded by an unofficial evaluation of the platforms available on the market.

In May, it became clear that the MoD decided to continue with the latter option, as the Minister of Defence, Mariusz Blaszczak, announced that the ministry had sent a formal Letter of Request to the US Defence Security Co-operation Agency in regards to the planned acquisition of F-35A LIGHTNING II fighters.

Future 5th generation fighter jets will complement the currently operated fleet of 48 F-16C/D Block 52+ fighters. Their acquisition will allow for the gradual phasing out of legacy, Soviet-era Su-22 bombers/fighters and MiG-29 fighters, which no longer present required combat effectiveness due to their deteriorating technical condition and obsolete onboard equipment. According to Wojciech Skurkiewicz, the Secretary of State at the MoD, the number of 5th generation fighters in the Polish Air Force's inventory may increase as the ministry envisions procurement of another batch of 16 fighters after 2026.

Under the current TMP, the Polish MoD will also try to finalise other strategic modernisation programmes, such as the procurement of a series of new, modern submarines capable of launching cruise missiles (Orka), an unspecified number of coastal defence vessels (Miecznik), tactical,

medium range unmanned aerial vehicles (Gryf), micro-class UAVs destined for use in urban terrain and equipped with day/night electro-optic observation systems (Wazka), multirole patrol/reconnaissance military aircraft with IMINT, SIGINT and RADINT capability (Plomykowka), new attack helicopters (KRUK), additional 120mm RAK wheeled mortars and 155mm KRAB self-propelled tracked howitzers, long-range rocket artillery squadron armed with US HIMARS systems (HOMAR), new guided anti-tank missile systems (PUSTELNIK), infantry fighting vehicles (BORSUK) and a fleet of light multipurpose 4x4 vehicles (MUSTANG).

The future will show whether the MoD will manage to finalise all these procurements and if the modernisation priorities will not be modified, as European and transatlantic security system will be subject to constant changes, shaped by various events and factors, not all of which are related to Poland and its nearest geopolitical environment. Nevertheless, it is not hard to imagine that the Polish authorities will continue to follow all developments on the political landscape and try to correctly identify emerging threats, adjusting country's foreign policy and security goals accordingly. ■

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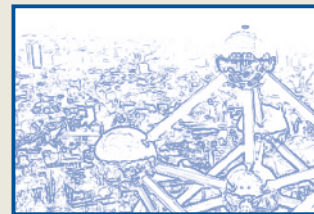
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# The Brussels Backdrop



## NATO and Ukraine

Joris Verbeurgt

In this and in the next Brussels Backdrop, we will discuss relations between Ukraine and NATO. In part one, we will explain the historical background of Ukraine and the difficult position it occupies between the Atlantic powers and Russian Federation. We will then outline why Ukraine is important for the West and for Russia, the steps taken by NATO and Ukraine to strengthen ties during the 1990s and the deplorable situation the country was in at that time. In the next Brussels Backdrop, we will discuss events since the start of the new Millennium.

### A History 'Written in Blood'

Ukraine is a country in Eastern Europe bordering EU and NATO members Poland, Slovakia, Hungary and Romania in the West, Belarus in the North and Russia in the East. In the South, the Black Sea offers access to the Mediterranean Sea, passing the Turkish Straits. Moldova is squeezed between

Ukraine and Romania. With a surface of over 600.000 sq km, Ukraine is the largest European country, slightly larger than the territories of Spain and Portugal combined. The nominal GDP for 2019 is estimated at around €120Bn. Excluding Crimea, Ukraine, with its capital Kiev, has a population of around 43 million. The ethnic composition and the history of Ukraine are complex, but nevertheless important for a full understanding of today's perceptions and sensibilities in relation to NATO. Ethnically spoken, Ukraine is very diverse, the two largest ethnic groups being ethnic Ukrainians (78%) and ethnic Russians (17%). Most of the former live in western and central Ukraine, while most of the latter in the Eastern part.

It is no understatement to say that Ukrainian history is 'written in blood'. In the 10th and 11th centuries, Kiev was the centre of an empire that laid the foundations of Ukrainian as well as of Russian national identity. Later on, Turks, Tatars (descendants of the Mon-

golian Golden Horde), Poles, Russians and native Cossacks all fought, with varying degrees of success, for dominance over (parts of) Ukraine. Invasions and chronic rebellions, usually followed by relentless repression, lead to periods of anarchy and famine. The 20th



Photo: Wikipedia

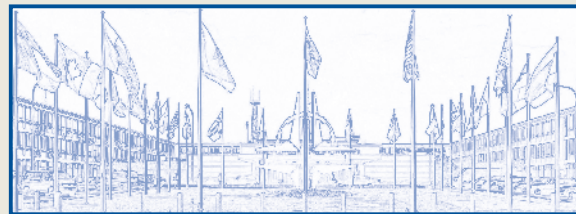
century proved extremely bloody for the Ukrainian people. Ukraine suffered terribly during the First World War and was one of the main battlefields of the Russian Civil War in which the Ukrainians had to simultaneously fight off the Poles, the Whites and the Reds. In 1921, the Russian Bolsheviks, under the command of Trotsky, victorious and forced Ukraine to become one of the founding members of the Union of Socialist Soviet Republics (USSR) a year later. In the meantime, Ukraine had lost half of its territory to Poland. In the late 1920s, Stalin took the collectivisation of Ukrainian agriculture well in hand, ordering regular troops and secret police to see to it. The forced collectivisation and the institutionalised terror led to one of the greatest (and least known) famines in world history. In 1932 and 1933, around 5 million Ukrainians died of hunger in a region that, before Soviet rule, was known as the granary of central and eastern Europe. The Great Famine, or 'Holodomor' in Ukrainian, retains a central place in the Ukrainian collective memory. The Ukrainian people also suffered dearly during the Second World War as: neither the German invaders, nor the Soviet 'liberators' showed any pity with the Ukrainians. Stalin purged any opposition inside Ukraine, including mass murder and deportation to Siberia

Photo: Office of the President of Ukraine



**After the collapse of the Soviet Union, Ukraine pursued full nuclear disarmament and gave up the third largest nuclear weapons stockpile in the world. Depicted above is an August 1996 inspection team visit to a former Soviet ICBM Silo in Ukraine.**





of peoples that had sympathised with the Germans. In 1953, Nikita Khrushchev, who was intimately familiar with Ukraine, succeeded Stalin as Soviet leader. A year later, he transferred Crimea, an integral part of the Russian Empire since Catherine the Great's victory over the Ottomans in 1783, from Russia to Ukraine. When the USSR broke up in 1991, Ukraine (including Crimea where the Russian Black Sea fleet is stationed), became independent. However, as a member of the Commonwealth of Independent States (CIS), Ukraine initially remained within Moscow's zone of influence.

## Domestic Politics and Foreign Interests

Compared to other regions in the former Soviet Union, prospects for Ukraine were favourable and the economic conditions good. However, the economy slowed down and between 1990 and 1999, Ukraine lost 60% of its GDP. Inflation skyrocketed and dissatisfied with the economic conditions and the enormous levels of crime and corruption that plagued the country saw Ukrainians revolt, organising numerous strikes. In 1996, a new Constitution and new currency were introduced by president Leonid Kuchma. Kuchma, however, was criticised by his opponents for latent corruption, electoral fraud, and for a centralisation of power. Russia, under the dubious leadership of Boris Yeltsin, had no means of stopping Ukraine from going its own way.

In 1997, the (former) Soviet Black Sea Fleet, by then in a deplorable state, was partitioned between Russia and Ukraine and an agreement was signed that Russia could lease the headquarters and bases in the Crimea for the next 25 years. At the same time, Ukraine pursued full nuclear disarmament and gave up the world's third largest nuclear weapons stockpile. In exchange for various guarantees from the West, Ukraine dismantled and removed all strategic bombers from its territory. Internally divided, Ukraine also became an 'apple of discord' between the West (USA, EU and NATO) that favoured, of course, a pro-western course, while Russia tried to keep Ukraine in its traditional sphere of influence. Especially for Russia, a lot was at stake. Ukraine was one of its major trade



Photo: US National Archives

**A swearing-in ceremony on the Day of the Defender of Ukraine, 14 October 2017**

partners and by far the largest importer of Russian goods, especially gas and crude oil. Ukraine relied for 80% of its energy supplies on Russia, making Ukraine dependable on Russia and giving Moscow immense influence in Ukrainian affairs. Moreover, some important oil and gas pipelines ran over Ukrainian territory from Russia to Western European markets.

In Ukraine, domestic politics, energy security and foreign relations are inseparably intertwined. Parts of the electorate, mostly situated in West- and Central Ukraine, are eager to join the EU and NATO, while others, mostly in Eastern Ukraine, insist on preserving the historical ties with Russia. The stakes are high for all parties and therefore, it is no wonder that Russia and Ukraine have undergone periods of ties, tensions, and outright hostility. Internally divided, Ukraine also became an 'apple of discord' between the West (USA, EU and NATO) that favours, of course, a pro-western course, while Russia tried to keep Ukraine within its traditional sphere of influence and NATO away from its borders.

## NATO and Ukraine

Although promises had been made to Gorbachev that NATO would not seek enlargement in the direction of Russia in Central and Eastern Europe, NATO wasted no time

in developing relations with Ukraine. Immediately upon achieving independence in 1991, Ukraine joined the North Atlantic Co-operation Council (now the Euro-Atlantic Partnership Council). Three years later, it joined the Partnership for Peace Programme, the first CIS member to do so. In 1996, Ukrainian soldiers deployed in Bosnia and Herzegovina as part of the NATO-led peacekeeping operations IFOR and SFOR and, year later, the NATO Information and Documentation Centre opened in Kiev. In July 1997, the NATO Allies signed the Charter on a Distinctive Partnership with Ukraine at a summit in Madrid, establishing the NATO-Ukraine Commission. Principles and arrangements for the further development of relations were set out and areas for consultation and co-operation identified. Furthermore, Ukraine established a diplomatic mission to NATO and, 1999, a NATO Liaison Office opened in Kiev. That same year, Ukraine participated for the second time in a NATO-led peacekeeping force in Kosovo, as part of a Polish-Ukrainian Battalion. In the next Brussels Backdrop, we will discuss developments since 2000, when Russia under Putin took a different stance towards Ukraine shifting towards the West. The Orange revolution, Euromaidan, Russian military intervention and the annexation of Crimea all resulted from that.

# “We truly are stronger together!”



Photos: US Navy

**Interview with Vice Admiral Lisa M. Franchetti, Commander, US 6<sup>th</sup> Fleet/Commander, Task Force 6/Commander, Striking and Support Forces NATO/Deputy Commander, US Naval Forces Europe and Africa/Joint Force Maritime Component Commander Europe**



**ESD:** The Mediterranean (including the Black Sea) is a key friction zone between NATO and a recently assertive Russia. It is also a crisis zone for European security. What is the special role (mission) of the 6<sup>th</sup> Fleet in the Mediterranean?

**VADM Franchetti:** As the operational arm of the US Navy in Europe and Africa, the 6<sup>th</sup> Fleet employs naval forces across the area’s seas and oceans – the Atlantic, Baltic, Mediterranean, Black, and all around Africa – to deter malign and illicit activity, build maritime domain awareness, and ensure freedom of manoeuvre in the global commons. Our presence in the Mediterranean represents a 70-year long tradition of commitment to this incredibly important region. We work closely with NATO and all of the navies that border the Sea to build a shared maritime picture and hone our ability to operate together at sea across the full spectrum of maritime operations. From the Mediterranean, we have tremendous reach – we work to counter violent extremist organisations in Libya, support Operation Inherent Resolve and strike Syria’s chemical weapons infrastructure, provide for the Ballistic Missile Defence of Europe, and respond to humanitarian crises/natural disasters and a myriad of other situations that arise in the maritime domain.

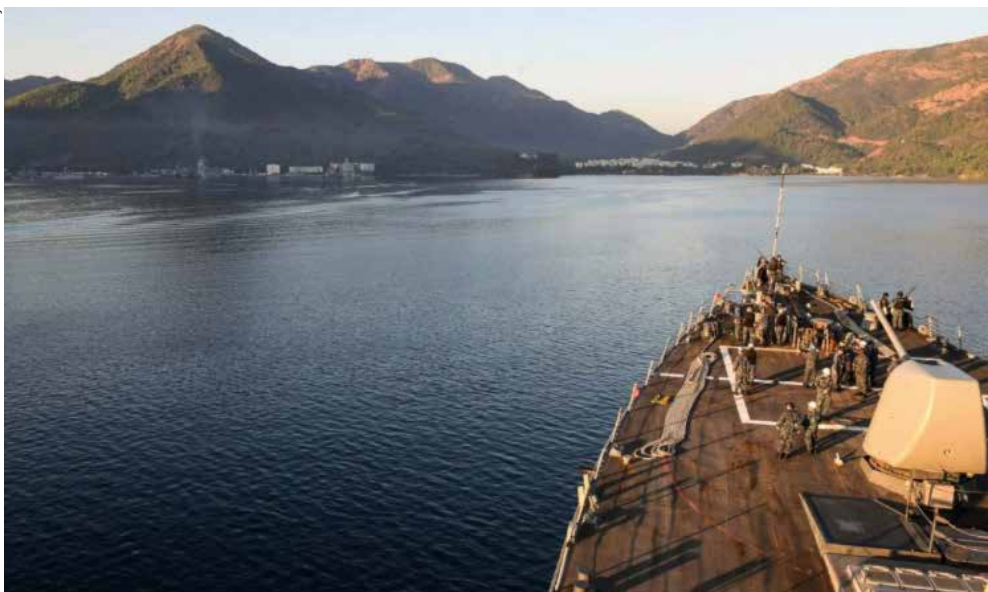
**ESD:** What are the major maritime security challenges in the Mediterranean?

**VADM Franchetti:** As it has been throughout its history, the Mediterranean is a busy and vital waterway and the nexus of various

threats emanating from the shore. Every day, I put myself in the middle of the Mediterranean and look at 360 degrees of challenge. To the south we have the challenges of instability pressing forward towards Europe in the form of violent extremism, illicit trade and trafficking, and migration. To the East, we have the ongoing conflict in Syria, the increasing presence of Russian Coastal Defence Cruise Missiles (CDCM) and maritime forces operating forward through the Black Sea and out of their leased base in Tartus, ongoing concerns caused by Iran’s ballistic missile programme and Iranian proxy forces

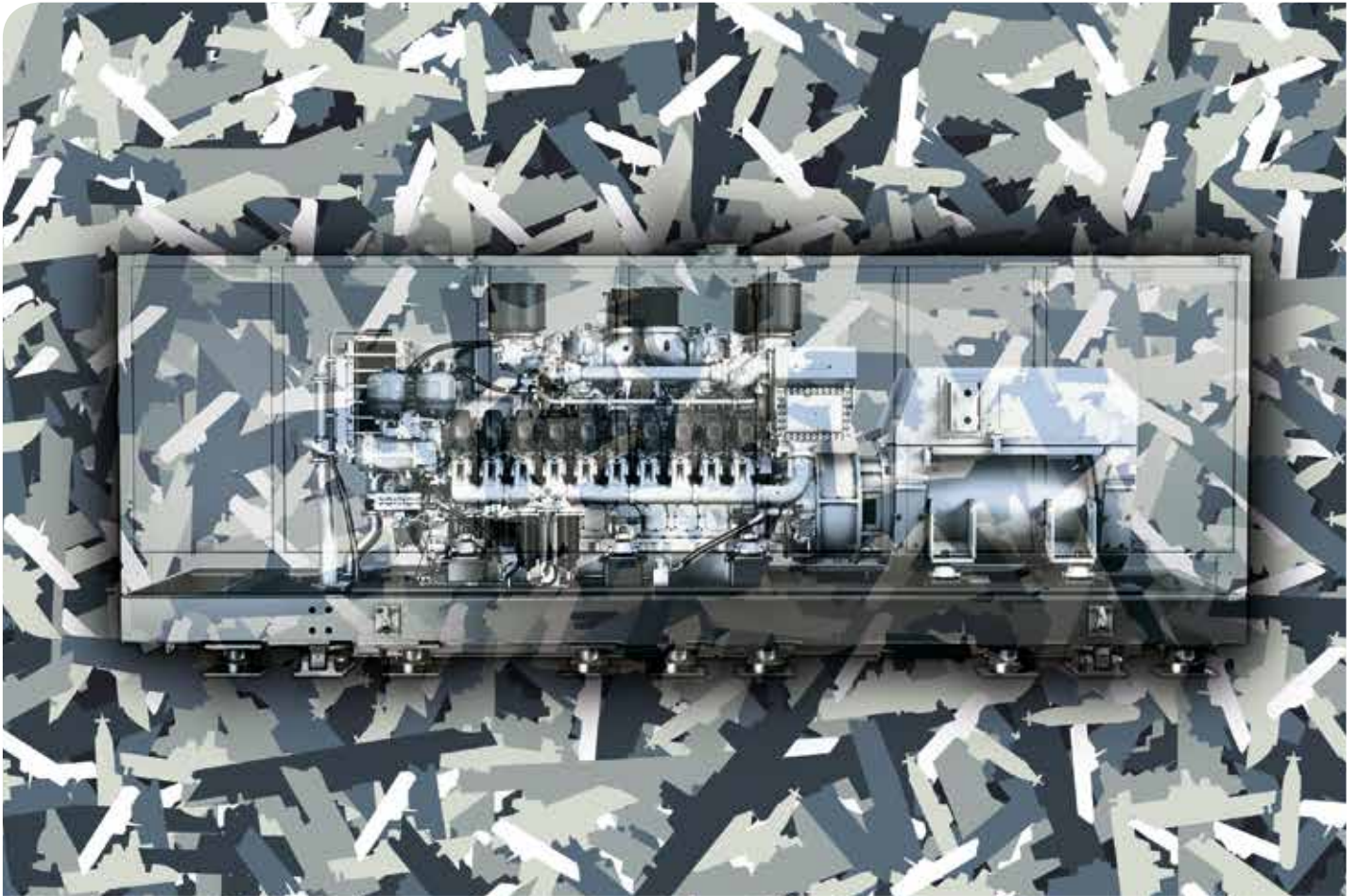
operating in this area, and friction caused by the discovery of vast oil reserves in the Eastern Mediterranean. And we see ever increasing Russian and Chinese presence and activity across the northern coast of Africa, as they seek to rebuild/build relationships and gain access.

**ESD:** The Second Fleet has been reactivated and a new Atlantic Command has been established. What are the consequences for the 6<sup>th</sup> Fleet concerning mutual support and operational co-ordination and co-operation with the Second Fleet?



Photos: US Navy

**The Arleigh Burke-class guided-missile destroyer USS DONALD COOK (DDG 75) participated in the Turkish-led maritime exercise "Dogu Akdeniz" in 2017**



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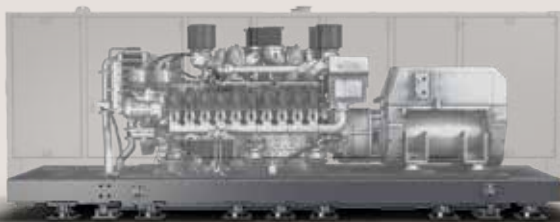
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**VADM Franchetti:** I am very excited about the stand-up of the US Second Fleet, a westward-facing Fleet designed to protect the Sea Lines of Communication, support Allies, and defend the US homeland while maintaining an expeditionary capability to conduct maritime operations across the Atlantic, High North, and greater European region. They are another “manoeuvre arm” for Naval Forces Europe, and we have been extremely successful in seamlessly coordinating both real world operations and exercises across the US Combatant Commander boundary in the Atlantic. We believe that the adversary will seek to exploit any gap or seam presented – our job is to erase those seams and foil their efforts, practicing in peacetime to be equally effective in our coordination in crisis and in combat.

Also to clarify the question, there is no ‘Atlantic Command’, the new NATO command in Norfolk is Joint Forces Command – Norfolk. JFC Norfolk will join JFC Brunssum and JFC Naples as one of Supreme Allied Commander Europe’s three joint forces commands.

**ESD:** The area of responsibility of the 6<sup>th</sup> Fleet extends even to Africa. How does the 6<sup>th</sup> Fleet achieve this additional mission/task?

**VADM Franchetti:** Our focus in Africa is supporting US Africa Command’s (AFRICOM) key lines of effort, especially Strengthening Partner Networks and Enhancing Partner Capabilities. We work closely with our African partner navies and coast guards in coordination with other Euro-Atlantic partners to develop a collaborative network designed to facilitate shared maritime domain awareness and the capability to help African states secure their maritime spaces. Helping them counter piracy, illicit trafficking, illegal fishing, and other maritime crimes are our primary focus areas. We conduct three major annual exercises in Africa: Cutlass Express (within the western Indian Ocean), Obangame Express (in the Gulf of Guinea), and Phoenix Express (in the Mediterranean). Each exercise has shown an increase in both leadership and capability in our African partners, and have been fully supported by key European partners. In Africa, we also support AFRICOM’s counter-Violent Extremist Organisation (VEO) operations working hard to eliminate the threats where they exist and prevent further attacks in the US, Africa, and Europe.

**ESD:** Do the BMD (ballistic missile defence)-ships of the 6<sup>th</sup> Fleet operate in the Black Sea occasionally or regularly?

**VADM Franchetti:** Our BMD ships routinely operate in the Black Sea, as well



*The ARLEIGH BURKE class destroyer USS CARNEY*

as in all of our other seas. Because they are top-line multi-mission platforms, they can conduct their BMD mission as well as other missions and participate in training and exercises with our Allies and partners throughout the region.

Just this year, DONALD COOK, ROSS, and CARNEY have all operated in the Black Sea, conducting bi-lateral training with Bulgaria, Romania, Ukraine, Turkey, and Georgia, as

ported in Rota, Spain, with new DDGs complete with the latest BMD technology, other weapons systems upgrades, and helicopters. We look forward to having this increased capability in our theatre of operations.

**ESD:** The 6<sup>th</sup> Fleet means an investment of the United States in European security. Do the European NATO nations contribute sufficient support for the 6<sup>th</sup> Fleet?



*The German Navy ship HESSEN integrated in a US-led carrier group*

well as multilateral exercises like the US-Ukraine hosted Sea Breeze and Bulgaria-hosted Breeze.

As you know, these ARLEIGH-BURKE class destroyers are the centrepiece of our forward-deployed force, and, along with Aegis Ashore Romania, are part of the US European Phased Adaptive Approach (EPAA), our commitment to defend Europe from ballistic missile threats from outside the region. Starting next year, the US Navy will begin to replace these DDGs, home-

**VADM Franchetti:** We have incredibly strong relationships with all the NATO navies individually as well as with Allied Maritime Command (MARCOM) and its standing naval forces. All of my 6<sup>th</sup> Fleet forces leverage every opportunity to train and operate together with their NATO colleagues at sea, under the sea, in the air, and ashore. Whether we are working with a high-end BMD or strike-fighter navy, a navy with exquisite mine warfare capabilities, and everything in between,



**The USS MOUNT WHITNEY is one of two BLUE RIDGE class amphibious command ships and the flagship and command ship of the US 6<sup>th</sup> Fleet.**

we learn a great deal from our partners. They have the best understanding of the environment, geography, best practices, and local patterns of life. From my perspective, the NATO navies are fully supportive and committed to improving our collective capabilities, interoperability, and readiness.

A few examples from the past year: FGS HESSEN and ESPS MENDEZ NUNEZ both did cooperative deployments with two recent US Carrier Strike Group deployments, HARRY S TRUMAN and ABRAHAM LINCOLN, respectively. To sustain our deployed readiness, we conducted Carrier Air Wing Training events with Norway,

Portugal, Italy, Lithuania, and the UK last year and expect to add more in the future. Our forward-deployed destroyers leverage training and certification programs in the UK and France. Specifically, DONALD COOK conducted integrated training and ROSS conducted integrated operations with the FS CHARLES DE GAULLE Carrier Strike Group. From an exercise perspective, NATO navies fully participated in all 6<sup>th</sup> Fleet Exercises: 18 nations participated in BALTOPS, 12 nations participated in SeaBreeze, 13 nations participated in Formidable Shield 19, a live-fire BMD/IAMD exercise off the Hebrides Range in Scotland, and a combined 48 nations participated in Obangame/Phoenix/Cutlass Express. I could go on and on. The reality is that we have a real advantage in the maritime domain: all navies operate in the same environment, under the same conditions, using the same basic procedures. As a result, we look for and leverage every opportunity to “plug in and play together,” adding to the credibility of our deterrence while building readiness to defeat and win, should we be called upon to do so. We truly are stronger together!

**The interview was conducted by Dieter Stockfisch.**

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# The Flagship of the Royal Australian Navy



Photo: Guy Toremans

**Air Commodore Rick Owen**

**ESD talked with Air Commodore Rick Owen, AM, RAAF – the Commander Joint Task Force 661 – onboard his flagship HMAS CANBERRA during the task force’s Indo-Pacific Endeavour 2019 (IPE-2019) deployment.**

The Indo-Pacific Endeavour 2019 (IPE-2019) deployment, the third iteration of the Australian Defence Force’s annual multiport ‘humanitarian assistance/disaster relief’-focused engagement with countries in South and Southeast Asia, kicked-off on 11 March 2019. The IPE-2019, or the Joint Task Force 661 (JTF-661), comprises the Royal Australian Navy’s amphibious assault ship HMAS CANBERRA, the ADELAIDE class frigate HMAS NEWCASTLE, the ANZAC class frigate HMAS Parramatta, the replenishment tanker HMAS SUCCESS, two MRH-90 helicopters, four TIGER Armed Reconnaissance Helicopters (ARH) of the Army’s 1<sup>st</sup> Aviation Regiment and more than 1,200 personnel from the Royal Australian Army’s 2nd and 3rd Battalions, the Australian Army Band, RAAF personnel and Australian public servants.

**ESD:** Commodore Owen, can you elaborate on the origins of the IPE series please?

**Owen:** The Indo-Pacific Endeavour-series is one of the most important activities, if not the most important, of the Australian Defence Force (ADF) aimed at promoting security and interoperability through exercises and capacity building activities with regional forces.

The series was introduced following the strategic objectives of the 2016 Defence White Paper. When the Australian Defence Force dispatched the first task group, in 2017, codenamed ‘Indo-Pacific Endeavour 2017’ (IPE-17), the then Defence Minister Christopher Pyne described the event as Australia’s “premier international engagement activity to enhance partnerships.” The 11-week deployment saw the task group visiting Brunei, Cambodia, Micronesia, India, Indonesia, Japan, Malaysia, the Philippines, South Korea, Singapore, Thailand and Timor-Leste. Last year, we targeted the South Pacific, and this year, we deployed to South and Southeast Asia. Australia is also increasing its focus on maritime issues at regional forums such as the East Asia Summit and the Indian Ocean Rim Association.

**ESD:** What were the major objectives of this year’s edition?

**Owen:** IPE-2019 was geared towards enhancing maritime security and maritime situational awareness through joint military exercises, counter-terrorism serials and humanitarian assistance and disaster relief (HA/DR) activities with the armed forces and other national organisations of those countries we visited. This deployment also tested the RAN’s new Maritime Task Group concept. In order to counter growing threats across the Indo-Pacific region, the Royal Australian Navy (RAN) is undergoing a major fleet re-capitalisation designed to improve the sea service’s operational capability. The sea service published its Fleet Warfighting Plan 2022 (FWP22) in January 2019 in which it details the RAN’s blueprint for delivering a high-readiness capability. With the MTG’s future staff acting as the Commander Joint Task Force staff throughout the IPE-19, this underlined the speed with which we intend to deploy this new construct on operations.

**ESD:** Any ‘firsts’ included in this year’s edition?

**Owen:** Yes, IPE-2019 was marked by a few ‘firsts’. It was the Australian Joint

Task Force’s inaugural deployment on board a ship and, to my knowledge, also the largest Joint Task Force to deploy into the Indian Ocean region so far. Another scoop was that Australia’s defence industry has been incorporated into Indo-Pacific Endeavour. Several Australian defence industry companies showcased their products and services on board HMAS CANBERRA during the port visits. These include the BUSHMASTER and HAWKEI multirole protected vehicles and an EF88 Advanced Steyr from Thales Australia, the DRONESHIELD’s drone gun and the Soldier Combat Ensemble from Australian Defence Apparel, and products from Aspen Medical.

The IPE 2019 was also notable for the overseas deployment of the Army’s TIGER Reconnaissance Helicopters (ARH), which used this deployment to trial their amphibious capability in the framework of the Army’s programme to develop an amphibious Air Combat Element – comprising the TIGER ARH, MRH-90 TAIPAN and CH-47F CHINOOK helicopters. For the first time, the Australian Army Aviation Corps (AA Avn) conducted a shore-to-ship flight operation involving TIGER ARH helicopters deployed from a foreign airbase.

And for the 25-year old HMAS NEWCASTLE and 33-year old HMAS SUCCESS, the IPE-19 is their final operational deployments as both ships are scheduled to decommission by the end of this year.

**ESD:** How did you and your staff prepare for this deployment?

**Owen:** Preparations for our staff, made up of 50 ADF-personnel, augmented by cyber, legal, logistics, and policy specialists, already started in the second half of 2018. A few weeks prior the kick-off of the IPE-19, we embarked onboard HMAS CANBERRA to participate in the RAN's exercise 'Ocean Explorer', a major training activity off the coast of Western Australia, organised between 17 February and 10 March. This exercise provided not only high-end blue-water warfighting training and certification for the units that were to take part in IPE-2019, but also allowed me and my staff to get used to living onboard and work in a 'floating office'. For most of us this was our first time at sea, working together in the confines of the warship



Photo: Guy Toremans

**HMAS CANBERRA, JTF-661 flagship, has an overall length of 230.8 metres, a beam of 32 metres, a draft of 7.08 metres and displaces 27,851 tonnes. The flight deck, fitted with a 12° ski jump, is some 27.5 metres above sea level.**

ship chandlers for any further requirements we needed along the way. For our logistics team, it was a huge task and they have done an incredible job.

**ESD:** Do you feel HMAS CANBERRA was adequately equipped to serve as flagship?

**Owen:** My staff and I were quite impressed and pleased with the facilities provided on-

merous activities, for example, exercises with the armed forces, humanitarian aid and disaster relief training sessions with local communities. In Sri Lanka, we carried out a passage exercise (Passex) with Sri Lankan Navy's offshore patrol vessel SNLS SINDURALA and the landing ship SNLS SHANKTHI. Between 2 and 11 April, we conducted the bilateral Australian-Indian exercise AUSINDEX 2019 in the Bay of Bengal, off Visakhapatnam. The Indian Navy took part along with the destroyer INS RANVIJAY, the frigate INS SAHYADRI, the corvettes INS KILTAN and INS KORA and the submarine INS SINDHUKIRTI. AUSINDEX 2019 focused on anti-submarine warfare and included submarine-on-submarine and surface-on-submarine serials, tactical maritime manoeuvres as well as combined aircraft sorties against unmanned aerial targets. For this exercise, we were joined by our submarine HMAS COLLINS and a RAAF P8-A POSEIDON maritime patrol aircraft. In Malaysia, we participated in the ASEAN Defence Ministers Meeting-Plus, or ADMM+ maritime exercise 'BersamaShield 2019'. and Prior to arrival in Changi Naval Base for IMDEX ASIA 2019, we took part in a Passex with units from Brunei, China, India, Indonesia, Japan, Philippines, Singapore, South Korea, Thailand, US and Vietnam

While in Thailand, we participated in military co-operation missions and a simulated search-and-rescue exercise with the Royal Thai Navy and soldiers. In Vietnam, we continued to assist the country in enhancing its maritime security capability through providing positions on naval training courses and co-operation activities.

**ESD:** What have been the highlights?

**Owen:** This is a complicated question indeed. Each port had its own unique highlights, such as the opportunity to commemorate ANZAC day in Port Klang, Malaysia, experiencing the wonderful cultural shows



Photo: Guy Toremans

**The flight deck, with a total surface area of 6,464 m<sup>2</sup> of which 4,750 m<sup>2</sup> available for flight operations, is configured for simultaneous take-off and landing of up to six medium-sized helicopters. Depicted are two TIGER Armed Reconnaissance Helicopters (ARH) and a S70A-9 BLACK HAWK at the rear.**

**ESD:** I suppose that logistics was not an easy task. Did you encounter any problems along the way?

**Owen:** Indeed, such a large deployment requires quite a lot of forethought and planning. Of course, there are hiccups on any deployment of this magnitude. However, nothing that could not be worked out with co-operation, and hard work put in by all of the staff. Luckily, we had ample storage space onboard HMAS CANBERRA and HMAS SUCCESS, and during our port visits we received tremendous assistance from both our logistics personnel and the local

board HMAS CANBERRA. No wonder she is the flagship of the Royal Australian Navy. However, I would be remiss if I didn't want more communications bandwidth. However, I think every commander would say they never have enough.

**ESD:** Can you elaborate about the nature of your interactions with the countries you visited?

**Owen:** Throughout this 16,000 nautical miles deployment, we visited seven countries – India, Indonesia Malaysia, Singapore, Sri Lanka, Thailand and Vietnam. In each port, we conducted nu-

in each port and meeting people from all over the Indo-Pacific region, to name but a few. The most interactive 'navy-to-navy' activities were the exercise AUSINDEX with the Indian Navy and our participation in the IMDEX ASIA 2019 maritime exhibition in Singapore. However, all the opportunities and activities made the IPE-19 deployment a fantastic time for all.

**ESD:** What is your overall assessment of the IPE 2019 and how do you see the evolution of the series?

**Owen:** The IPE series is designed to develop shared understanding and trust with the countries in our region, and to build the capacity to jointly respond to events in the region. And with Australia conducting operations and engagements that are becoming too large for one service alone, the navy, air force and army joined their efforts in order to enhance interoperability between them. As such, IPE-2019 was a great opportunity to trial our Joint Task Force concept. I think each IPE is an improvement on the last as we get used to each other, build closer relationships and focus more on the finer details of what we can achieve together.

The real success of IPE-19 may not be known until countries in our region, including Australia, need help from each other. That could be next year, or it could be several years 'down the track'. If we build that trust and those capability knowledge bases, we will know who to call.

**ESD:** Being in command of the IPE 2019, was it different from what you expected?

Photo: Guy Toremans



**An Australian LARC-V Lighter Amphibious Resupply Cargo vehicle**

**Owen:** Yes. IPE-19 was quite complicated in terms of the numerous activities and engagements we had to conduct. Personally, it was a completely different environment to exercise my command. My team performed superbly in co-ordinating this complex series of international engagements, and the embarked forces represented Australia with characteristic warmth and professionalism. When you deploy this many people for this long a time, you sometimes need to adopt a delicate and sensitive touch. Yet, overall, it has been a great revelation for me. I now know how Hannibal must have felt crossing the Alps with his elephant army.

**ESD:** There is an increased focus on the Asian/Pacific region. Is Australia planning to create a larger presence in the Pacific?

**Owen:** Australia is very keen to increase its engagement in the region, not necessarily expanding our presence but instead by improving the 'footprint' we already have in order to best utilise our capabilities to further enhance regional security and stability.

**ESD:** What is your programme the coming months?

**Owen:** Upon returning from IPE 19, and after some well-earned leave, the RAN's Maritime Task Group staff will be reconfigured into a Sea Combat staff in order to prepare our participation in the bilateral Australia/US exercise 'Talisman Sabre 2019' (TS19) in July. TS19 is designed to practice our respective military services and associated agencies in planning and conducting Combined and Joint Task Force operations, and improving combat readiness. The exercise incorporates force preparation activities, amphibious landings, land force manoeuvre, urban, air and maritime operations and Special Forces activities. During the exercise, HMAS CANBERRA will act as the command platform for the Sea Combat Commander (SCC) and HMAS ADELAIDE acting as the main amphibious command platform. The Maritime Component Commander (MCC) will be based ashore within Joint Forces Headquarters (JFHQ) from where he will command three task groups: the Royal Australian Navy task group, a US Navy Carrier Strike Group, and a Japan Maritime Self-Defence Force Task Group.

**ESD:** Commodore Owen, many thanks for granting this interview.

**The interview was conducted by Guy Toremans.**

Photo: Royal Australian Navy



**Commander Joint Task Force 661 Air Commodore Richard Owen, AO, (right) and members of HMAS CANBERRA's company and embarked forces conduct weapons training on the portable Weapon Training System Simulator aboard HMAS CANBERRA during "Indo-Pacific Endeavour 2019".**



# NATO's EOD Centre of Excellence

## Team of Authors of NATO EOD CoE

The idea of establishing the NATO EOD Centre of Excellence materialised in 2004 during the Istanbul Summit where the Slovak Republic assumed the role of Lead Nation for EOD and consequent management area within the CNAD Programme of Work in Defence against Terrorism (CNAD POW DAT).

Centres of Excellence (CoEs) are a key part of NATO's wider framework and key contributors to the transformation of the Alliance. They provide tangible benefits to NATO by developing and delivering real capacities while being a hub for subject matter expertise in their particular field. Amongst other things, they provide: in-depth studies and research in key areas as well as subject matter expertise to training and exercises; they support the gathering and dissemination of lessons learned, contribute to doctrine development and offer relevant courses to NATO Member States and other Partner countries.

Since its establishment, the EOD CoE has provided products and services consistent with NATO standards, practices and procedures, enhancing interoperability of NATO Member States and collaborating Member States in the field of EOD. In 2016, recognising its high standards of training and education, the Supreme Allied Command Transformation awarded the EOD CoE with a Quality Assurance Unconditional Accreditation Certificate making it the official NATO Education and Training Facility.

The EOD CoE's mandate is to support and enhance the NATO transformation and



vide a structured framework to capture and pass on practical experiences and knowledge.

- Training and Education: To create training products and offer specialised education with the overall aim of broadening the general and particular knowledge of EOD areas of expertise.
- Concept and doctrine development and standardisation: To participate in the development and revision of NATO concepts, doctrines and standardisation publications.
- Technology, research and development: To provide EOD technological capability development, improvements and define requirements for new EOD technologies.

To enhance interoperability within NATO, the EOD CoE contributes to NATO's standardisation process by supporting the development of the Allied EOD publications, leading to the creation of the first ever NATO Doctrine published at the start of 2018. It supports selected NATO Standardisation Working Groups (WG) – mainly EOD, MILENG, Force Protection and C-IED WGs, within the EOD WG, it leads the Terminology Team and the Lessons Learned Team. As such, the EOD CoE is leading the development of NATO EOD Terminology.

## Training and Education

The historical and current development of armed conflicts results from the dissatisfaction of insurgent groups with political, economic or religious domination. Enemy activities are reflected in hostile techniques, tactics and procedures (TTPs), which determine the risk assessment of explosive devices and threat analysis that



Photo: NATO EOD CoE

**The Slovak Republic is the framework nation of the EOD COE, with the Czech Republic, France, Hungary, Poland and Romania also being contributors.**

After many national and multi-national talks within NATO, the EOD CoE was finally established in October 2007 and successfully accredited in April 2011 as the 16th unique CoE. The EOD CoE, as most of the NATO CoEs, was established based on MCM-263-03 Concept for Centres of Excellence Principles, with the Slovak Republic as a Framework Nation and with contributions of sponsoring Member States, namely the Czech Republic, France, Hungary, Poland and Romania.

operational efforts in the field of EOD. In line with this, all key tasks are performed in support of four CoE mission pillars:

- Lessons learned and analysis: To pro-

"A COE is a nationally or multi-nationally sponsored entity, which offers recognised expertise and experience to the benefit of the Alliance, especially in support of transformation. A COE is not part of the NATO Command Structure (NCS), but forms part of the wider framework supporting NATO Command Arrangements (NCA)."

NATO COE definition (MCM-236-03)

NATO and coalition forces must address. To reduce the number of NATO and coalition forces casualties in potential EOD accidents (due to unskilled, non-professional manipulation with Explosive Ordnance (EO)), a number of training activities have been developed by NATO Member States that increase their and partnering units force protection and freedom of manoeuvre once they are operating in low or high threat environments. As a solution in countering EO risks and threats, the NATO EOD CoE contributes to Alliance transformation and its operational efforts through the provision of EOD expertise and development of NATO-wide tactics, techniques and procedures while also remaining up to date in terms of technical development. Witnessing more and more attacks in every part of the world, homemade explosives are still a growing concern for NATO

Driven by new and emerging trends, the EOD CoE, with the Education and Training portfolio, aims to reflect the identified gaps in the NATO Military Engineering (MILENG) discipline. The EOD CoE further elaborates these gaps as the MILENG discipline recognized specialized institution. The high quality of deliverables on offer is not only a merit of the NATO EOD CoE, but also the CoE's external EOD COI, which helps to orchestrate the EOD CoE level of 'excellence'. The EOD CoE Education and Training programme is effectively connecting the EOD COI entities with the goal of enhancing NATO's transformation and interoperability through professional training. Within new challenges, the CoE contributes as an active partner to the full EOD capabilities training spectra through multi-national EOD related exercises, supporting not only the execution of exercises itself, but also in

be best harmonised to meet agreed targets in the most effective manner possible. It should facilitate the timely identification, development and delivery of the necessary range of forces that are interoperable and adequately prepared, equipped, trained and supported as well as the associated military and non-military capabilities to undertake NATO's full spectrum of missions. As a permanent member of Military Engineering Defence Planning Advisory Group (MILENG DPAG), the EOD CoE brings its substantial contribution by providing expertise and experience to the NDPP planning domains in a comprehensive and effective manner.

### EOD/IED Equipment Catalogue

The CoE has established the EOD/IED Equipment Catalogue in order to provide more information about EOD/IED equipment, brochures, training manuals and user opinion statistics. The project's main aim is to facilitate the search for suitable equipment for EOD specialists as well as to support other armament subject matter experts in the area of procurement, when they seek available market solutions. It is equally important to promote new technologies and advanced EOD equipment along with the operators' practical experience from deployment in the field. Having this kind of assessments/information in one central location brings the full spectrum benefits to all those actors involved. It also provides an excellent opportunity for manufacturers to promote their products, highlight the latest upgrades and technological progress within the EOD community.

Photo: NATO EOD CoE



**The EOD CoE organises homemade explosives courses at basic and advanced levels.**

due to the availability of ignition devices on the market. In order to face this challenge, the EOD CoE organises homemade explosives courses at basic and advanced levels. Based on a request from NATO, the CoE assumed the role of a project manager for NATO CBRN EOD Incident Management Training. Another well-tailored training provided is NATO EOD Staff Officers Training. All trainings are provided for sponsoring Member States, NATO, and its partners in general, education and individual training for EOD staff and at an operators level as the target audiences. The CoE's personnel conduct EOD training for multinational missions on the basis of its publications. On the other hand, the analysed shared knowledge on Homemade explosives subjects are tailored to already trained EOD personnel based on best practice.

"The detection, identification, onsite evaluation, rendering safe, recovery, and final disposal of unexploded explosive ordnance. It may also include explosive ordnance that has become hazardous by damage or deterioration. Also called EOD."

(Dictionary of Military and Associated Terms. US Department of Defence 2005)

the whole planning process, including workshops such as Bison Counter, Northern Challenge and Ardent Defender.

### NATO Defence Planning Process (NDDP)

As EOD is an integral part of NATO capabilities, it also supports the NDDP. The EOD CoE is recognized as the appropriate body through which EOD expertise and knowledge is embedded into the NDPP. The aim of NATO defence planning is to provide a framework within which national and Alliance defence planning activities can

### EOD Workshop Series

The EOD Workshop Series is a tool for organising events as a main responsibility of the LLAB. It began in 2012 as an EOD LL Seminar, where EOD operators and staff officers had the opportunity to share their lesson learned. As the EOD CoE is continuously heading towards more valuable and efficiently organised events, the EOD WS became a platform not only for LL sharing but also started to serve as a workshop supporting development of particular projects/studies since 2017. With this approach, the

EOD Workshops indirectly connect knowledge obtained from past lessons learned with possible current EOD trends and forms the basis for future EOD capacities.

## Exoskeleton in the Battlefield Project

The Wales Summit declaration identified the exploratory role of the Defence Against Terrorism Programme of Work (DAT POW) in identifying emerging defence technologies that can improve the readiness of NATO forces. While robotic technologies are progressing fast, the operational concepts need to be refined in order to benefit from such technological advances. In this context, maintaining awareness amongst NATO allies on future capacities can make dismantled operations more efficient, much safer and more effective.

The Integration of the Exoskeleton in the Battlefield project was launched in 2017 by the EOD CoE in co-operation with the NATO Communications and Information Agency (NCIA) and financed by the DAT POW. This project organises live demonstrations of Exoskeletons for Human Performance Augmentation (EHPA) technologies currently available on the market in order to update the technological baselines that need to be considered in the development of dismantled soldier operational concepts. The results of this project will help NATO and its Member States understand the technological readiness of EHPA capabilities, support the formulation of minimum military requirements (MMRs) in this area and also refine operational concepts.

## NATO EOD Demonstrations and Trials Series

Over the last few years, the threat of terrorist attacks directed at the military and civil population has considerably increased. In response, a number of measures have been taken to mitigate these threats. The NATO EOD Demonstration and Trials is a biennial event intended for experts from NATO and partner armed forces, defence industry, highlighting the latest EOD/IEDD technology developments through live demonstrations, exhibitions, conferences and seminars, and has now become a popular periodic event. The main aim of the event is to gather mission experience parallel to the present needs and development of new EOD technology and protective equipment. It is also an excellent opportunity for manufacturers, research and development institutes and NATO bodies to present the latest technological solutions for improving the capacities of EOD operators to the operational and armament community.



Photo: NATO EOD CoE

**NATO EOD Demonstration and Trials is a biennial event for experts from NATO and partner armed forces and the defence industry, highlighting the latest EOD/IEDD technology development.**

The CoE organises the series of NATO EOD Demonstrations and Trials for Explosive Ordnance Disposal in a close co-operation with the Counter Improvised Explosive Devices Centre of Excellence in Madrid, Spain and Military Engineering Centre of Excellence in Ingolstadt, Germany with the support of the Slovak Ministry of Defence. It is funded through the NATO Defence Against Terrorism Programme of Work (DAT POW) established under the auspices of the NATO HQ Emerging Security Challenges Division.

discussions and demonstrations of technologies are connecting different organisations and bodies, which further serves to continuously share the future of DAT POW efforts and roadmaps.

## Former Warsaw Pact Ammunition Handbooks

The NATO EOD CoE has already published a series of three handbooks of conventional ammunition manufactured in the Former Warsaw Pact (FWP) countries and is involved



Photo: NATO EOD CoE

**EOD experts organise training courses for the staff of all NATO member countries on current trends in IED design and EOD techniques.**

The event also provides an 'open space' for discussions as part of the conference, seminars, or panels concerning about urgent military requirements for the DAT POW and its relationship to the direction of actual roadmaps. Within NATO EOD Demonstrations and Trials, there are also live demonstrations, which provide a good opportunity to present equipment/device capacities or new methods and TTPs relating to the EOD area of interest.

Organising the event broadens knowledge about current and future aspects of EOD also related technology capability horizons and confirms or identifies gaps. In so doing,

in preparing a fourth one. These publications are mainly focused on the explosive elements such as bursting charges, fuel charges, detonators, fuzes and warheads. These handbooks have become quickly popular among the interested communities. The download of digital copies of the publications requires a registration to the EOD CoE website in line with Terms of Reference. ■

### Disclaimer

*The information and statements expressed in this article are those of the NATO EOD CoE and do not necessarily reflect the official policy of NATO.*

# “We procure our equipment from those sources that are most suitable for our military.”



Photo: MoD Serbia

**Interview with Nenad Miloradović,  
PhD, Acting Assistant Minister  
for Material Resources, MoD,  
Republic of Serbia**

**ESD:** What scenarios do the Serbian Armed Forces have to be prepared for?

**Miloradović:** The missions and tasks of the Serbian Armed Forces are defined by the National Assembly of the Republic of Serbia in accordance with the Constitution. They follow from the inalienable rights of the Republic of Serbia on individual and collective defence, while being in accordance with Article 51 of the Charter of the United Nations and fundamental principles of the international law governing the use of force. So, the key missions of the Serbian Armed Forces are: defence of the Republic of Serbia from external armed threats; participation in building and preserving peace in the region and the world within appropriate UN and EU missions; and support of civil authorities in combating security threats and responding to natural disasters, industrial accidents and other calamities. The ongoing task of the Serbian Armed Forces is to train and prepare its commands, units and institutions to complete their assigned missions and tasks.

**ESD:** What are the major current armament programmes of the Serbian Armed Forces?

**Miloradović:** Serbia has intensified the modernisation of its military equipment to enable its armed forces to deal with today's security challenges. Last year we have completed "Project 1500" which was focused on equip-

ping Special Forces. Additional "Project 1500+" is to follow which is focused on infantry units. Infantry modernisation includes LAZAR-3 wheeled armoured combat vehicles, new protective equipment, new infantry weapons, optronics, ammunition, reconnaissance platforms, robotised platforms, ground vehicles and aerial vehicles, both for reconnaissance and combat purposes. The goal of Project 1500+ is to fully equip Serbia's infantry battalions. Another programme is the modernisation of Serbia's artillery, which comprises two major projects. One is the NORA 155mm self-propelled howitzer, including ancillary equipment such as ammunition, logistic vehicles and so on. The other is the upgrade of the multiple launchers of the OGANJ missile system, including new fire control units. Phase 2 of this upgrade programme will equip the system with guided ammunition, improving accuracy at ranges from 25 up to even 50km. Both projects will enable Serbia's artillery to meet all future challenges.

**ESD:** Regarding these programmes, do you rely on the technological expertise of exclusively Serbian defence companies?

**Miloradović:** The components of these programmes have been completely developed by Serbian industry, reflecting our national strategy. Introducing systems into the armed forces and then using them is only the first part of the lifecycle story. We have to ensure main-

tenance and ongoing modernisation of the systems across the entire life cycle, and in the end this philosophy is very similar to standard procurement principles in other parts of Europe. We modernise our land forces step by step: the infantry, artillery and mechanised forces and we will stick to the schedule. As for air force modernisation, the most important projects are already completed in terms of financing. Most of the equipment has been already delivered, the balance is expected to be delivered soon and some additional related services to follow.

**ESD:** In military aviation do you rely on cooperation with Russian companies?

**Miloradović:** We procure our equipment from those sources that, with respect to each individual project, are most suitable for us. Our ambition is to procure products and services from Serbian companies whenever possible, but sometimes it is not possible, so we have partners all over the world. We have bought in Russia, in the US, in EU member states. One recent project has been the procurement of nine H145M helicopters from Airbus. During his visit to the Airbus site in Donauwörth (Germany), in November 2018, the Serbian Minister of Defence Aleksandar Vulin accepted the first aircraft destined for the Serbian Air Force, which was handed over in a ceremony held at the Partner 2019 exhibition in Belgrade in June 2019.



Photo: Airbus

**Airbus delivered the first H145M helicopter to the Serbian Ministry of Defence at the Partner exhibition in Belgrade in June 2019. Depicted are Aleksandar Vučić, President of the Republic of Serbia (right), and Bruno Even, CEO of Airbus Helicopters.**

**ESD:** Do you emphasise technology transfer?

**Miloradović:** Certainly. Most of these foreign procurement projects related to capital weapon systems are coupled with a kind of technology transfer. Taking the H145M project as an example, it is the starting point for intense cooperation between Airbus and Serbian industry. Another announcement made at Partner 2019 was that the Moma Stanojlovic aeronautical plant, located near Belgrade, has been certified by Airbus Helicopters to carry out

maintenance work on the SA 341 / SA 342 GAZELLE helicopters.

**ESD:** Digitisation is now one of the major challenges: how do the Serbian Armed Forces face it?

**Miloradović:** A couple of programmes are related to this. Our new telecommunications programme deals with digitisation in a holistic way, eliminating obsolescence, standardising equipment and paving the way for the new battle management system with which our

fighting vehicles and artillery will be equipped. The intention is to integrate all sensors, to distribute data to the forces in theatre, and to connect all levels from the lowest to battalion, brigade and up to theatre level commands. Regarding cyber security, this falls under and is covered in the context of all of our digitisation activities.

**ESD:** The Partner 2019 exhibition allowed visitors some insights into the broad range of unmanned vehicles developed by Serbian industry. How important are these technologies for Serbia?

**Miloradović:** We have been among the pioneers in the field of unmanned aerial systems, so we have a lot of experience on which to build! One of our latest projects is the MILOŠ unmanned ground combat vehicle, developed by the Serbian Military Technical Institute (MTI) and the Trstenik-based Namenska company. It has successfully passed its trials at the Serbian Technical Test Centre, and will be introduced into service soon. The international interest in this technology is remarkable, too. Over and above this, Serbia's industry offers numerous drones and quadcopters for different purposes like reconnaissance, combat, critical material supply, EW etc.

**ESD:** Finally, regarding international cooperation, how important are defence industrial partnerships for Serbia?

**Miloradović:** In former times you had to have in-house expertise and production for most of the sub-systems you needed. Nowadays, in the age of globalisation, industrial organisation is based on widespread supply chains, even in the sensitive area of defence. This applies to Serbia's defence industry as well. There are some technologies we master ourselves without any foreign partners, but there are others that have to be managed in cooperation with international partners. As a consequence we are always open to establishing partnerships based on our experience, to create a win-win situation for everyone. Republic of Serbia is declared military neutral country and is physically part of European continent, with ambitions of EU integration. In that manner, numerous defence activities are passed through EU institutions and organisations, like our membership in HELBROC EU BC (Battle Group) or administrative arrangement with EDA (European Defence Agency), as well as different bilateral military-technical activities with EU members.



Photo: MoD Serbia

**The international interest in Serbian defence technology as the MILOŠ unmanned ground combat vehicle (here showcased at the UMEX 2018 exhibition in Abu Dhabi) is growing.**

**The interview was conducted by Peter Bossdorf.**

# The British Defence Ecosystem

## Defence Procurement & Defence Industry Cooperation

**David Saw**

**Britain finds itself in an extraordinary situation at the moment. As it heads towards Brexit at the end of October, British politics has never been so fractious. In all honesty nobody can claim to know exactly what is going to happen next, but whatever does happen will have an impact on British defence procurement and the British defence industry.**

Normally a discussion of British defence policy, defence procurement and the state of the British defence industry would be a rather straightforward undertaking. For many years, give or take the odd unorthodox decision, defence had in most respects

trial collaboration. Obviously not everything went according to plan. There were plenty of missteps in terms of collaborative defence programmes for example. Despite this there was no getting away from the fact that Britain was a key defence partner in Europe.

Minister by the end of this year if the political turmoil continues.

To understand the factors that could potentially shape the British defence environment, we need to briefly explore the current messy political situation in Britain. To simplify matters, the best starting point is the general election of May 2015. The election was won by the Conservative Party led by David Cameron. He had previously been Prime Minister in a coalition government after the 2010 election, but he had won a majority in 2015. The issue of Europe plagued the Conservative Party with both pro and anti-Europe groups agitating within the party. Cameron believed that if he offered a national referendum on membership of the EU that would resolve the Europe issue once and for all. Also the strong showing of the anti-EU UK Independence Party (UKIP) in 2014 European elections offered a potential vote bank for Cameron once he offered a referendum.

The failure of the Labour Party to win the 2015 election saw its leader Ed Miliband resign and this set in train a leadership election. The end result was the election of Jeremy Corbyn as Labour leader, and a massive shift to the hard left in political terms. The arrival of Corbyn and the change in political direction by Labour was seen as a once in a generation opportunity to reshape British politics by the extreme left. The referendum promised by Cameron, the European Union Membership Referendum that was held in June 2016, was supposed to lead to a vote to remain in the EU. Instead the opposite occurred and Britain was set on the path of BREXIT. Cameron resigned and was succeeded as Prime Minister on 13 July 2016 by Theresa May. May would last in office for three years and 12 days; she had never wanted BREXIT and her inability to deal with the BREXIT issue would doom her leadership. May had also called

Photo: UK Government



***Boris Johnson, the new British Prime Minister, making his first official visit to Scotland as leader visited the Royal Navy's HMNB Clyde. Johnson is the third British Prime Minister since the BREXIT vote and is trying to navigate out of the political storm battering Britain.***

followed a rather predictable path no matter the political complexion of the government of the day. Britain worked to meet its NATO commitments, supported the creation of a European defence identity and actively worked to progress European defence indus-

At the present time, the predictable nature of British defence issues has most certainly entered the realm of unpredictable. This reflects the fact that the political situation in Britain has changed dramatically and this process of change seems set to continue. In consequence, the future path of British defence policy and defence industrial policy can only be truly determined once the political situation becomes clearer.

Perhaps the best way to illustrate how complicated British politics have become is to note the following fact: from 1979 until 2010 Britain only had four different Prime Ministers. Britain is now on its third Prime Minister since July 2016 and could be seeing the appointment of a fourth Prime

### Author

**David Saw** is a specialist defence writer based in Paris, France. He has a long and comprehensive record of writing and managing defence magazines at the highest level, from the USA through Europe to Asia, and is now a regular contributor to ESD.

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**The capabilities of the British military and defence industry are nicely illustrated by this image of the carrier HMS QUEEN ELIZABETH leaving Rosyth for sea trials in June 2017. The Royal Navy will eventually have two of these 65,000 tonne displacement carriers, with F-35B aircraft being the central element of their air group.**

a general election in June 2017 looking to increase her majority; instead she managed to wipe it out. Eventually she had to admit defeat and resigned, being succeeded by Boris Johnson.

With the Conservative Party in crisis, the Labour Party ought to have benefited. In the June 2017 election Corbyn turned out to not be the electoral liability that most had assumed; Labour won 40% of the vote and gained 30 seats in Parliament. Two years on and the Labour Party is itself split between those who wish to remain in the EU and to hold a second referendum to confirm that fact and those who wish to steer clear of the whole Europe issue. Even worse, the party has become embroiled in a host of profoundly damaging anti-Semitism scandals. The end result is that Corbyn's Labour now appears to be a truly damaged brand.

## Leadership Vacuum

All of which means that the two main British political parties are damaged, that restoring faith in the British political system is urgent and that at this point nobody really has a clue on how to clean up this mess. The problem is that while politics is in chaos somebody has to start developing policy and make some hard decisions on future major defence acquisition programmes. Then comes the issue of what if the ideological character of the British government changes? If the political direction goes to the left that could wipe out a number of major procurement programmes, see the defence budget severely reduced and see more onerous export restrictions imposed on the defence industry. On the other hand, there might be no change whatsoever in defence policy direction, although in those circumstances one would have to feel very lucky to assume that there would be any more money made available for defence. Before going on to discuss key programmes

and industry, it is necessary to talk about defence funding. There seems to be a general agreement that the British defence spending is inadequate to support the operational tasks allocated to the British military. To put defence spending into context, it is necessary to consult a generally unbiased source of budgetary information in the form of the Stockholm International Peace Research Institute (SIPRI) Military Expenditure Database. This database has two measures of defence expenditure; the first of these is military expenditure as a percentage of Gross Domestic Product (GDP) and military expenditure in constant 2017 US dollars.

Back in 1988, the SIPRI figures have British military expenditure as a percentage of GDP running at 3.8%; military expenditure has not reached this total since that point. In constant 2017 dollars expenditure was US\$50.787Bn in 1988, rising to US\$51.245Bn in 1989, up

again to US\$51.318Bn in 1990 and up to US\$51.910Bn in 1991. Between 1992 and 1999, British defence expenditure would decline on an annualised basis. Then after 2000 the expenditure trend started to turn upwards. It should be noted that improved British economic performance was reflected in the fact that military expenditure in GDP terms was running at between 2.2% and 2.3% from 2000 to 2008. In constant dollar terms, military expenditure in 2008 at US\$52.587Bn was the first year to surpass the 1991 total.

In 2008, military expenditure reached US\$54.983Bn, the only year in recent times where it has surpassed French military expenditure according to SIPRI figures, with military expenditure in 2009 amounting to US\$56.163Bn equivalent to 2.4% of GDP. This year was the high point in terms of British military expenditure. From 2010 to 2017 military expenditure was on a downward trajectory in constant dollar terms. Then came a slight recovery last year and, according to SIPRI, current military expenditure is at US\$49.997Bn, the highest total since 2012. It should also be noted that SIPRI figures show military expenditure as a percentage of GDP running at between 1.8 and 1.9% since 2014.

These figures should not be accepted uncritically, although they are extremely valuable for identifying defence expenditure trends. The highly respected International Institute of Strategic Studies (IISS) has British defence expenditure at the sixth largest in the world at US\$56.1Bn, surpassing France in seventh place by US\$2.7Bn. SIPRI classifies France as having the larger level of military expenditure.



**The present and potential future of British combat airpower in the shape of the Eurofighter TYPHOON and the TEMPEST. The TEMPEST programme will provide the UK and its international partners with a new fighter in the 2030s. The industry grouping for the programme, Team Tempest, includes BAE Systems, Leonardo, Rolls-Royce and MBDA. Sweden has signed an MoU to collaborate with the UK on future fighter development.**



In June NATO released a document "Defence Expenditures of NATO Countries," covering the period 2012 to 2019. According to the NATO definition, British defence expenditure as a percentage of GDP is running in excess of 2% and has done so in the full 2012 to 2019 period. They estimate expenditure as a percentage of GDP will be 2.14% for 2018 and 2.13% for 2019, both years being an increase on the figures for 2015, 2016 and 2017.

## Controversial Programmes

While it is demonstrably clear that Britain spends substantial sums of money on defence, past experience also demonstrates that it is often the case that available funding does not cover what is required to handle operational requirements. Unfortunately past experience also tells us that the British MoD is perhaps not the best manager of money and that its programme management skills are often sadly lacking. But then again the same could be said about most British government departments.

What is also becoming obvious is that the MoD cannot afford costly mistakes in its finances and programme management, especially in the current political environment. If the complexion of British politics changes only slightly then the MoD will be targeted and one major programme will be front and centre in terms of criticism. The programme in question is the "Continuous At Sea Deterrent (CASD)," the British submarine-launched nuclear deterrent force.

To retain the CASD capability it is necessary to replace the current force of four VANGUARD class SSBN with a new submarine class initially called the SUCCESSOR class, but then officially named as the DREADNOUGHT class, from the early 2030s onwards. These SSBN will be equipped with TRIDENT II D5 SLBM, according to a British Parliamentary report on the TRIDENT issue: "The UK has title to 58 missile bodies, which are held in a communal pool at the Strategic Weapons Facility at the Kings Bay Submarine Base in Georgia, USA. Maintenance and in-service support of the missiles is undertaken at Kings Bay at periodic intervals." The DREADNOUGHT class SSBN will feature a Common Missile Compartment for the TRIDENT SLBM which is being developed in conjunction with the US. TRIDENT will remain viable as weapons system until the 2040s, with the Common Missile Compartment providing the basis for a successor missile programme with the US.

According to the MoD factsheet on the DREADNOUGHT submarine programme, "sustaining the nuclear deterrent in-service currently accounts for around 6% of the



Photo: Crown Copyright

**While there have been significant equipment acquisitions in recent years, available funding cannot cover all programme requirements. The CHALLENGER 2 Life-Extension Programme (LEP) is a case in point: it is now believed that the LEP programme will only cover 150 tanks or fewer, significantly reducing an already small tank force.**

annual defence budget." The MoD states that: "our latest estimate is that manufacturing the four DREADNOUGHT submarines is likely to cost a total of £31Bn (including inflation over the lifetime of the programme); we have also set a contingency of £10Bn." The MoD goes on to say that; "this is a prudent estimate based on past experience of large, complex projects, such as the 2012 Olympics, Crossrail or High Speed 2."

When the MoD talks about 'prudent estimates' based on large complex projects it is somewhat concerning. Bear in mind that the Crossrail project was supposed to cost £15.4Bn and be open in December 2018; it is now likely to cost £17.8Bn and be open in late 2020 or early 2021. As for High Speed 2 (HS2), this railway programme was supposed to cost £56Bn, though some cost estimates have it at £100Bn, and the current government has just instituted a rigorous review to see whether they ought to scrap the programme.

As far as the DREADNOUGHT SSBN programme is concerned, should the political climate not change that dramatically then this programme will continue. With British nuclear submarine building currently running late on the SSN class, it would be fair to assume that the SSBN will be late as well and this will increase costs. Taking a more gloomy perspective, if British politics tilts

leftwards then the SSBN programme is deeply under threat. The Campaign for Nuclear Disarmament declares that: "replacing Trident will end up costing at least £205Bn. This is an appalling waste of money. Cancelling Trident replacement would mean we could invest billions in the NHS, our education system or new homes." Cancelling the SSBN programme would be hard to resist for a left-wing government. Cancellation would also severely strain the defence relationship between Britain and the US.

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Testing for knowledge

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**British troops participating in the "Trident Juncture" NATO exercise held in Norway in October 2018. Whatever the future holds, British military capabilities remain highly professional and deployable, making a vital contribution to European defence.**

## Future Development

The RAF is due to receive its last Eurofighter TYPHOON by the end of this year, but work has already started in Britain on a successor programme and the outline timetable is that the new combat system will have an operational capability from 2035 onwards and will then be available to replace early tranche TYPHOON aircraft. The British programme currently operating under the Team Tempest banner inevitably finds itself seen as being in direct competition with the similar Franco-German *Système de Combat Aérien du Futur* (SCAF). There are however distinct differences in how Britain is approaching its programme compared with the SCAF effort.

At the Farnborough Airshow in July 2018 in front of a mock-up of the TEMPEST future combat system, the MoD officially announced its new Combat Air Strategy paper, the blueprint for the development of this new system. At the core of this programme is Team Tempest; this consists of BAE Systems, Leonardo, Rolls-Royce, MBDA and the RAF Rapid Capabilities Office. The British government has made an initial investment of some £2Bn in the programme and the official timetable is: "Early decisions around how to acquire the capability will be confirmed by the end of 2020, before final investment decisions are made by 2025. The aim is then for a next generation platform to have operational capability by 2035."

The start of the TEMPEST programme reflects the determination of Britain to preserve its combat aircraft capabilities; the economic importance of military aerospace to Britain was highlighted: "The UK is already a world-leader in the combat air sector, with a mix of skills and technologies unique in Eu-

rope, supporting over 18,000 highly skilled jobs. The sector delivers a turnover in excess of £6Bn a year and has made up over 80% of defence exports from the UK over the last ten years."

The British government realises that a programme of this nature cannot be a single-nation effort; indeed, the core industrial team members reflect that reality. BAE and Rolls-Royce can, in this context, be considered as home grown, Leonardo is the centre of the British defence electronics capability, but is centred on Italy, while MBDA is a pan-European company. What Britain wishes to avoid is another standard European collaborative programme. The Combat Air Strategy notes that: "if badly conceived, collaboration can increase programme overheads, cause delay, increase cost and deliver sub-optimal capabilities."

The approach on TEMPEST is based on the understanding that: "the UK will rapidly need to secure international partnerships for development and delivery." Making that work means that these partnerships must be based on "shared and realistic defence requirements" and not "political opportunism and industrial protectionism." The Combat Air Strategy talks of the need to: "share capability requirements, concepts and national technologies with key partners and allies to explore the feasibility of joint programmes." The Strategy then describes the need to: "ensure the partnering framework provides clear leadership, builds on the strengths of contributing nations and has as its primary purpose the need to deliver capability quickly with minimal bureaucracy and process."

Although SCAF and TEMPEST are two European programmes geared towards delivering the same general capability, the indus-

trial philosophy behind each programme is very different. The British concept is that the TEMPEST programme should have a much more open structure than a conventional European collaborative effort, and be far beyond the 'master and servant' construction of programmes such as the Joint Strike Fighter (JSF).

While SCAF is centred on French and German industry, Spain has now joined the programme broadening its scope. TEMPEST is also extending its reach; in July Britain and Sweden signed what was described as a 'landmark agreement' on future combat air. The MoD release states that: "The Memorandum of Understanding (MOU) commits both governments to work on a joint combat air development and acquisition programme, including the development of new concepts to meet both nations' future requirements."

The potential for TEMPEST to become a new kind of international collaborative defence programme is certainly there; indeed the implication is that potential partners need not be limited to Europe and that a more globalised approach is possible. What the TEMPEST effort could do is to totally redefine the international collaborative defence programme and perhaps challenge the existing industrial order in combat air systems. There can be no doubt that that the British defence industry remains both strategically and economically important. This was confirmed by the "UK Defence & Security Export Statistics for 2018," issued in July by the Defence & Security Organisation of the Department for International Trade. This revealed that British industry won £14Bn worth of defence orders in 2018, equivalent to 19% of the global market.

The defence industry does face challenges though. In June the Court of Appeal in London upheld a legal challenge by the Campaign Against Arms Trade (CAAT) contesting the British government decision to continue licensing defence exports to Saudi Arabia. The court effectively ruled that equipment exports to Saudi Arabia that are used in the conflict in the Yemen are in fact unlawful. The government continues to argue its case to set aside this judgement.

For Britain this is an era of political uncertainty, how matters evolve remains unclear. What is clear is that the British defence industry remains a significant national asset that makes a major economic contribution to the country and through programmes such as TEMPEST will continue to do so. As far as political clarity is concerned, whatever is going to happen at the political level ought to happen by the end of the year, meaning that 2020 could be a 'Brave New World' either in a positive or negative context. ■




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# Italy's New Defence Budget Plan: What Is New?

**Luca Peruzzi**

**The Italian government has presented a new budget plan detailing how much money it will spend on armaments programmes. This article examines how the money is to be allocated.**

Italy's 2019-2021 Defence budget planning document released on 5 July alongside the newly renamed 'Fund for the relaunch of the central administration investments and the development of the country for the 2019-2033 timeframe' within the 2019-2021 National Budget Law (including €5.8Bn extra-ordinary funds for defence and security provided by the Ministry of Economy and Finance together with the recently approved Ministry of Economic Development (MiSE) funding plan ensuring an additional €7.17Bn over the same period) are injecting new resources for procurement and current programmes, which only partially compensates for the overall funding requested by the Italian MoD for national and international duties.

## The Budget Plan

The 2018-2020 budget plan was released without the Government have taken decisions on the indicated procurement programmes, which were proposed again, approved and funded together with new ones within the new 2019-2021 budget plan. However, the procurement approval and delay in programme launch and the long-term 2019-2033 investment planning (with most of the budget concentrated from 2027-2028) is affecting defence programmes and international commitments. This situation is further exacerbated by the 'ordinary' defence budget reduced allocation for procurement (€1.8Bn versus €2.3Bn), together with recurrent and constantly high personnel expenditures (€10.3Bn on a total €13.7Bn 'defence function' available budget, which is sided by the Carabinieri's 'security function' investments) and slightly better (€1.7Bn versus €1.4Bn) operational funding for 2019 compared to 2018. This summer's political turmoil inside the Government is further complicating the situation, creating potential further slippage to this spending process.

As a result of the funding made available with the above-mentioned 'ordinary' and 'extra'-defence budget investments, the MoD's 2019-2021 budget plan supports the digitisation of its communication systems and networks and the protection of the

seven programmes and participant in a further 14 programmes. The completion of the COSMO-SkyMed second generation earth surveillance satellite constellation will boost the MoD's strategy in the space domain. In addition to two new-

Photo: Piaggio Aerospace



**The multi-year €700M programme to modernise the fleet of Piaggio Aerospace P-180 AVANTI transport and liaison aircraft includes the procurement of new AVANTI EVO version aircraft.**

defence infrastructure against cyber-attacks with two new main programmes being funded from 2019 on and lasting 15 years within a budget of €1.1Bn while maintaining operational efficiency of its platforms and systems (including configuration communal-ity and programmatic upgrading activities through an additional €1.6Bn multi-year programme). This will be supplemented by programmes to implement new-generation Identification Friend and Foe (IFF) equipment that enhances interoperability and participation in NATO/UE operations, to support the National Defence Research Programme activities with further funding mainly directed to unmanned vehicles, cyber and medical developments and to contribute to European PESCO and EDIDP/EDF initiatives. Under PESCO, Italy is the lead-nation in

radar surveillance satellites already funded and to be put in orbit from 2019, the MoD has funded another two satellites, which will complete the constellation by 2022, providing an enhanced weather-independent observation capability to Italian and French Defence systems, civil protection institutions, and commercial customers. The new Multi-national Space-based Imaging System – Common Interoperability Layer programme will allow the Italian and French MoD to have access to new-generation observation satellite systems represented by Italian COSMO-SkyMed second generation and the French Composante Spatiale Optique, providing high-resolution images in the visible, IR and multispectral bands, through a new interface being provided to the current



Photo: Luca Peruzzi

## Aerial Platforms

The MoD has also launched a multi-year €700M programme to modernise the fleet of Piaggio Aerospace P-180 AVANTI transport and liaison aircraft with the planned procurement of new AVANTI EVO version aircraft and upgrading of remaining in-service platforms in addition to a logistics support and flight simulation package. To support the industry workforce and expertise developed with the P-1HH HAMMERHEAD unmanned surveillance platform programme, after the cancellation of the more capable Piaggio P-2HH platform, the MoD is acquiring a P-1HH system, including two air vehicles and one ground station for homeland and civil protection joint-agencies use. Piaggio Aerospace will also maintain and support aerospace engines, equipping defence platforms.

The Light Utility Helicopter joint-armed forces programme will oversee the rationalisation of the AB-205/206/212/412s and AW-109 combat support and transport rotary-wing fleet through the Defence and Homeland forces with the new Leonardo AW169 in the military version to be certified soon. The Guardia di Finanza's Customs Service and the Carabinieri have already acquired the helicopters, and the Army and Navy will follow. The programme is funded with €382M following an overall request of €2.2Bn.



Photo: Luca Peruzzi

**The Italian Army will procure 398 LINCE light multi-role vehicles.**

**Funding for the long-awaited continuation of the VBM 8x8 FRECCIA AIFV is expected.**

satellite ground segments. This is in addition to the in-service support funding for other MoD's satellite programmes, including the OPTSAT-3000 optical and the SICRAL military communications satellites. The added funding made available by the Government in the 2019-2021 Multi-Year Defence Procurement and Sustainability Plan will also allow for the development, acquisition and launch of a third generation of communication satellites. Finally, additional funding is allocated for overall facilities modernisation (€350M) and environmental remediation (€173M).

The 2019-2021 multi-year budget plan will finally add funding for important operational capacities, which had lacked support in previous fiscal years. Among the joint-service funding, the MoD

will launch in 2019 the development and qualification programme for the ground-based air-defence MBDA Italia CAMM ER missile system, until now supported with company funding. Both the Army and the Air Force have an urgent requirement to replace the in-service ASPIDE/SPADA missile systems to reach the life-end from 2021. The Italian Navy will also be involved at a later stage in replacing the ALBATROS and ASTER 15. The €95M programme contract will see also the development of the missile launcher and its integration with the Army's Forza NEC C2 and Rheinmetall Defence X-TAR 3D radar, and Air Force's Medium Advanced Air Defence System to use SIRIUS C2 and Leonardo's KRONOS Land radar.

## Wheeled Platforms

Under the 'Soldato Sicuro' combat personal equipment programme, there are also new funds to modernise the soldier's individual equipment for the Army's, Air Force's and Navy's land forces with Leonardo-lead's Forza NEC developments. The overall €1.6Bn programme requirement is currently funded with €752.8M. The Army will also buy 398 LINCE 2 light multirole vehicles in different versions for €558M of which €305M has currently been allocated. After cancellation of the MH-47F special forces helicopter procurement, the Army finally launched the programme, although with a reduced extension, to develop solutions for the ARIETE main battle tank middle-life upgrade by CIO consortium (including Iveco Defence Vehicles and Leonardo) with enhanced mobility, fire control capabilities and logistic support to be applied to 125 platforms.

Disaster relief operations in recent years and on-going homeland missions by the Army have pushed the MoD to fund two programmes to purchase special vehicles and equipment for the Engineer Corps

(€380M) and to replace the AR-90 Land Rover and utility wheeled vehicles with new multi-purpose platforms to be delivered by Iveco (€77.4M). In the meantime, last June, the Ministry of Economic Development released €7.1Bn funding for the Defence sector which will provide an opportunity to launch or continue important procurement programmes. The Army is benefiting with funding for the long-awaited continuation of the VBM 8x8 FRECCIA AIFV and CENTAURO IIs MGS programmes, involving CIO consortium with Iveco and Leonardo, the NESS new Leonardo combat helicopter to replace the AH-129 MANGUSTA platform and NHIndustries NH90 TTH acquisition and in-service support programmes, the mid-life upgrading of the Army's SAMP/T batteries with new Leonardo multi-function High-Power Grand Land KRONOS radar and the joint-IT/FR development of the ASTER 30 Block 1NT munition for enhanced anti-ballistic missile capabilities. Moreover, among the programmes supported by the Defence budget, details have emerged on the co-operation between Italian and Israeli MoDs on the exchange and testing of technologies to be applied to FRECCIA and EITAN AFVs, and a future phase aimed to develop prototypes of wheeled and tracked vehicles with high communality for basic design and equipment. Under the 2019-2021 budget plan, the Italian Air Force will be able to launch the completion of Search & Rescue and the Personnel Recovery rotary-wing fleet of Leonardo AW-139 platform with €765.8M funding and developing advanced self-protection suites and upgrades for in-service equipment on both fixed- and rotary-wing platforms (€243.5M). The service will also be able to upgrade the air traffic control radars, installed on main air bases, and acquire fire-brigade airport vehicles to replace at-the-end of service life platforms. In parallel, the MiSE funding will allow for the acquisition of the F2000 TYPHOON (and in-service support) to be sustained, TORNADO Mid-life update, HH-101A Combat SAR helicopter and M-346 Lead-in Fighter/Advanced trainer procurement programmes as well as the launch of the M-345 basic/advanced trainer. It saw the contract award in June for the procurement of 13 aircraft in addition to an already procured five to be delivered from 2020. The continuance of the M-345 and the M-346 are key programmes for the new Air Force/Leonardo-newly established International Flight Training School with future operational bases at Lecce and Decimomannu. Although programme fund-

Photo: Italian Air Force



**MiSE funding will allow to sustain Italy's Eurofighter F2000 TYPHOON acquisition and in-service support**

ing has been stretched, the Eurofighter Typhoon and its Long-Term Evolution programme are considered key enablers in developing technologies to be applied to the to-be-procured 6th generation fighter. The 2019-2021 Defence programming document also provides an update on the F-35 development and procurement programme that will continue within the ordinary Defence budget. The €7.093Bn funded Phase One, involving the MoD, sees the acquisition of 28 aircraft – including 22 F-35A and six F-35B for Air Force and Navy by 2020 to be delivered by 2022-

2023, in addition to retrofit activities, initial logistic support until 2022, CAMERI facilities and the services' air bases and CAVOUR upgrading. The Phase Two associated with the multi-year production contract is due to be launched in 2021 with long-lead items to be funded from 2019, although the MoD has not yet committed to this procurement.

### Naval Platforms

The Italian Navy will see the procurement launch for new-generation U212 subma-

Photo: Italian Air Force



**An Italian Air Force Leonardo AW139**



Photo: Italian Air Force

**The HH-101A Combat SAR helicopter procurement programme should be able to be completed under the 2019-2021 budget plan.**

rines platforms under the U212 Near Future Submarine (NFS) programme. With an overall investment of €2,53Bn for four platforms in addition to in-service support and simulation tools, the programme is funded with €806M, which will allow for the development and procurement of the first submarine with initial support. The overall contract is expected to include options for three other boats. The 2019-2021 budget also includes procurement funding for a special operations & diving operations/Submarine Rescue Ship platform under a €424M programme and the development and qualification of the new-generation version of the TESEO/OTOMAT anti-ship missile Mk2/E (Evolved) as well as the obsolescence mitigation of the in-service Teseo Mk2/A. The latter programme's initial €150M phase will require a follow-on procurement and logistic support funding at an overall cost of €395.2M.

As the launch of three programmes was postponed from last year, the only new programme in the 2019-2021 budget is the development and procurement of the Hydro-Oceanographic Main Ship or Unità Idro-Oceanografica Maggiore capable of multi-theatre operations, including the Arctic region and equipped with unmanned deep-waters surveillance vehicles. To replace the 44-year old MAGNAGHI platform, the programme is funded with €300M. The MiSE funding allows the Navy to launch the U-212 NFS, TESEO Mk2/E, ASTER 30 Block 1 NT munition and the prosecution of the PPA, UNPAV, LSS, FREMM and NH90 procure-

ment and support programmes. The ordinary defence budget is supporting the CAVOUR overhaul and mid-life upgrade, the Leonardo BLACK SHARK Advanced heavy-weight torpedo and new crypto equipment among other procurement and continuing programmes. The budget plan also unveiled the launch of the international European Patrol Corvette development programme with an investment of €95M. The new multi-year spread financial resources also will allow the Carabinieri to further develop the SIC-OTE command, control and investigation infrastructure network within a €164M programme funded by MiSE.

The 2019-2021 multi-year planning document also provides for an overview of the procurement, upgrading and continuation of programmes to be funded during the 2020-2021 timeframe. The MoD will launch a study phase (€3M) as part of a €2.8Bn programme for 12 new large multi-purpose mine countermeasures vessels capable of operating remote controlled autonomous vehicles to replace the current Italian Navy's GAE-TA class, which is currently receiving a mid-life upgrade. The Air Force will be able to launch the mid-life refurbishment of MBDA STORM SHADOW stand-off weapon as part of a €57M programme and to acquire new generation weapon systems from national industry within reduced timeframe compared to Foreign Military Sales procurement channels, in addition to integrating the new and in-service weapon systems with the C61STAR-EW national network to guar-

antee an enhanced situational awareness and persistent information superiority. The service will also enhance the air expeditionary task force – combat service support systems to provide the necessary out-of-area support for 4th and 5th generation combat aircraft (€71.4M) and will be able to enhance weather radar surveillance and other equipment as well as introduce new dissemination network architecture (€14M).

Furthermore, there are also funds to develop a permanent and secure operational training networked architecture involving Air Force and other Armed Force's flight or mission simulators and guarantee the support of simulation equipment for Italian Army's 'live' training. The MoD will provide funding for the procurement of munition for training and NATO reserve replenishment – for a long time neglected – in addition to acquiring and further developing the new VULCANO family long-range guided and unguided munitions for the Navy. New funds will also allow for the procurement of LINCE vehicles to improve the Carabinieri's mobility in homeland security and out-of-area operations. Among the future international programmes yet-to-funded, the MoD unveiled activities on a new 6th generation combat aircraft programme

Photo: Leonardo



**The MoD will fund another two satellites for the COSMO-SkyMed second generation earth surveillance satellite constellation.**

as well as new guided-missile destroyers, new MALE platform and participation in a new European GBAD system against conventional/ballistic and hypersonic post-2030. ■

# The Future of Polish Land Forces and MBT Fleet

**Michał Jarocki**

For over a quarter of a century, the Polish Army has undergone constant restructuration, which was and still is intended to adjust it to operate in diverse and variable geopolitical and military conditions in country and/or abroad. This process has been carried out simultaneously with the ongoing technical modernisation of the land forces.

However, insufficient funding and other various budgetary problems, which resulted from, among other things, the political will of following governments to retain significant numbers of men and women under arms during peace time up

until the past decade (that generated high staff expenditures) have hampered the procurement of new weapon systems and the modernisation and upgrade of already operated platforms. As a result, over the past 25 years, many procurement programmes

decided to commence on a year's long process of reducing their armed forces, which in some cases lasted until the latest outbreak of conflict in Eastern Ukraine, which resulted in the diminishment of relations between the West and Russia and, therefore, worsening of the security system on the continent. Over the past decades, many of the Western European NATO member states transformed their armies from static, typically defensive formations dominated by heavy, tracked armoured vehicles to lighter but more mobile, quick reaction forces with the capacity to engage in combat or peacekeeping operations far from the homeland.

As an outcome of this transformation, a number of military equipment, mostly heavy, armoured vehicles, was declared as obsolete in the post-Cold War era, and, therefore, had to be either stored in reserve or simply phased out and eventually dismantled or sold to third party users. These processes were associated with a reduction of the sizes of the armed forces of many European states, resulting in limiting the number of men and women in uniforms serving on active duty. Many of them were put in reserve, while others simply had to end their careers and move into civilian life. The Polish Armed Forces were no exception to this situation, especially the Army, which through over a quarter of a century was subjected to a number of reforms, reorganising its core structure, reducing the number of troops, although on a smaller scale than other NATO allies and modernising, at least to a point, its combat equipment.



Photo: Polish MoD

*The Polish Army's units are grouped into three divisions composed of ten General Service brigades. Each General Service brigade has a 'triple' structure of its combat sub-units, comprising either three mechanised/motorised battalions or a mix of tank and mechanised battalions in proportions of 2:1, depending on whether they are heavy or light formations.*

## Author

**Michał Jarocki** is an independent, Warsaw-based defence expert who has reported on security issues and developments from a qualified "insider" position for many years.

of the Polish army, some of which were designated as having a crucial impact on the country's defence capabilities, have had to be either abandoned or rescheduled. The end of the Cold War and the fall of the Warsaw Pact suddenly reduced the risk of an outbreak of a conflict on a global, or at least continental scale in Europe. Therefore, a number of European states

## The Polish Army's Current Structure

In its current structure, most of the Polish Army's units are grouped in three divisions: 11<sup>th</sup> "Lubuska" Armoured



Cavalry Division, 12<sup>th</sup> Mechanised Division "Szczecin" and 16<sup>th</sup> "Pomeranian" Mechanised Division. These formations are composed by ten general service brigades: 10<sup>th</sup> Armoured Cavalry Brigade, 34<sup>th</sup> Armoured Cavalry Brigade, 17<sup>th</sup> "Wielkopolska" Mechanized Brigade, 2<sup>nd</sup> Mechanized Brigade, 7<sup>th</sup> "Pomeranian" Coastal Defence Brigade, 12<sup>th</sup> Mechanised Brigade, 1<sup>st</sup> "Warsaw" Armoured Brigade, 9<sup>th</sup> Armoured Cavalry Brigade, 15<sup>th</sup> "Giżycka" Mechanized Brigade and 20<sup>th</sup> "Bartoszycka" Mechanised Brigade as well as a number of auxiliary units such as air defence and artillery regiments. Additional operational support is provided by four independent brigades: 1<sup>st</sup> Aviation Brigade, 6<sup>th</sup> Airborne Brigade, 21<sup>st</sup> Podhale Rifles Brigade and 25<sup>th</sup> Air Cavalry Brigade.

Each of the general service brigades has a typical, 'triple' structure of its combat sub-units, which is composed either by three mechanised/motorised battalions or a mix of tank and mechanised battalions in proportions of 2:1, depending on whether it is a heavy or light formation. This is also supplemented by auxiliary units, like air defence and artillery regiments.



Photo: Polish MoD

**318 Polish T-72M1 MBTs will undergo overhaul and limited modification, which will result in a symbolic upgrade of their onboard equipment but no real capability improvement.**

Two divisions, which are stationed in the Western Poland, the 11<sup>th</sup> Armoured Cavalry Division and 12<sup>th</sup> Mechanised Division, are formed by three combat battalions, when at the same time the 16<sup>th</sup> Mechanised Division, the sole, eastbound division has four battalions at its core. In general, this provides for 30 combat battalions, either mechanised/tank or motorised.

### A New Division in the East

However, this 'typical' divisional/brigade structure will not be applied to the new 18<sup>th</sup> "Żelazna" Mechanised Division, which will be formed according to a decision taken by the Ministry of Defence (MoD) nearly a year ago. "In accordance to the decision of the minister of national defence, we com-

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### Poland's LEOPARD Modernisation Programme

The list of modifications and upgrades in the LEOPARD 2A4/PL modernisation programme includes: new/upgraded observation and aiming sites for the commander and gunner, improved ballistic protection of the turret, new electronic system for turret traverse and cannon elevation, installation of more effective fire/explosion prevention system, new command and control system, additional APU generator, additional cargo carrying equipment and upgraded evacuation/towing system adjusted to the higher weight of the platform, new fire control system, new ammunition (DM63 antitank and DM11 multipurpose) and day/night reverse camera for the driver.

Photo: Polish MoD



**In 2002 Poland bought 128 LEOPARD 2A4 MBTs from German stocks. Another batch of 119 ex-German MBTs, including 105 LEOPARD 2A5 and additional 14 LEOPARD 2A4 tanks, was acquired in 2014-2015.**

mence the process of forming of the 18th Mechanised Division, which command will be settled in Siedlce. However, its area of responsibility will reach as far as the Bieszczady region. We intend to expand the subunits which are currently stationed in the Eastern Poland, up to a size which will guarantee their high combat readiness”, announced the MoD back in autumn 2018. “Forming of such a big tactical formation is a very complex process, which will be spread over time. It will be finalised in several phases up until 2026, when its conclusion is expected”, the MoD added. According to the MoD, the future division will eventually consist of three brigades, including the 1st “Warsaw” Armoured Brigade, which is currently subordinate to the 16th Mechanised Division and the 21st Podhale Rifles Brigade which, as has already been stated, currently operates as an independent brigade. The future structure of the 18th Mechanised Division will also be supplemented by the future 19th Mechanised Brigade in Lublin, which should be established in the coming weeks and reach full final operational capability within the coming years.

The MoD declared that “the new brigade is expected to be certified by the 1st half of 2022, which simultaneously will confirm its [combat] readiness. On the other hand, the command and staff of the 18th Mechanised Division should reach combat readiness in the 1st half of 2021, while auxiliary units, like the reconnaissance battalion, as well as the artillery, air defence and logistical support regiments, should be completed in the 3rd phase of forming of the new division (...).” The general cost of this process could be as high as PLN27Bn (Polish Zloty) over the next decade. The future 18th Mechanised Division will differentiate itself from the currently existing division-level formations due to the number of combat sub-units divided between particular general service brigades, which it will be composed of. In this regard, the 1st “Warsaw” Armoured Brigade is supposed to be equipped with four (not three) combat battalions, including two tank battalions with LEOPARD 2 MBTs and two mechanised battalions (at first armed with the legacy, soviet-era BWP-1 infantry fighting vehicles, which eventually should be replaced by more modern platforms).

The new 19th Mechanised Brigade is expected to be composed of two tank battalions, including one new and one that will be transferred from the 21st Podhale Rifles Brigade (equipped with T-72 MBTs that will be modified in the coming years) and two mechanised battalions (BWP-1). At the same time, the 21st Podhale Rifles Brigade will most likely be reorganised and eventually be composed of three motorised battalions (equipped with Rosomak/Patria AMV 8x8 wheeled armoured vehicles) and one specialised mountain infantry battalion. As a result, the 18th Mechanised Division will consist of 12 combat battalions, which in theory will make it the strongest and most operationally capable division in the Polish land forces.

### The Future of the Polish MBT fleet

As much as a decision about reorganisation and increase of the size of the Polish land forces is reasonable and was long awaited, it may prove to be fruitless, if will not be accompanied by a significant boost of the army’s combat capability, which will have to be achieved by modernisation of its MBT fleet, most of which is composed of legacy Cold War-era platforms.

The tanks that are currently in the Polish army inventory are not able to successfully operate on the modern battlefield. Mostly due to their age and worsening technical condition but also because they were designed 30 plus years ago, when the requirements of operating such platforms on the battlefield were different from today. As a move in seemingly the right direction, the MoD has recently decided to overhaul and slightly modify over 300 T-72M1 MBTs. Under the terms of the agreement signed at the end of July with a consortium composed of the Polish Armaments Group (Polska Grupa Zbrojeniowa, PGZ), Zaklady Mechaniczne Bumar-Labedy and Wojskowe Zaklady Motoryzacyjne (WZM), the process should begin this year and run through to 2025. The programme is worth PLN1.75Bn and a number of other public and private defence companies, like PCO or OBRUM, will also take part in the process. The programme calls for overhaul and modification of up to 318 T-72M1 MBTs – which is an equivalent of five combat battalions – each equipped with 58 tanks plus two reserve companies with 28 vehicles. However, according to Wojciech Skurkiewicz, the Secretary of State in the MoD, only 257 T-72 MBTs are currently in the possession of the Polish Armed Forces, which means that the process will also include vehicles being kept in reserve, or rather phased out



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COMEXPOSIUM

Photo: Michał Jaroński



**Poland's fleet of LEOPARD 2A4IPL is scheduled to undergo a comprehensive modernisation programme.**

and stored by the Military Property Agency (Agencja Mienia Wojskowego, AMW). The scope of works under the newly signed contract will be limited to the sovereign capacities of the Polish defence industry. "We are modernising the equipment, which is in the inventory of the Polish Army. Thanks to this upgrade, main battle tanks will be equipped with modern targeting, navigation and observation systems, as well as new digital comms," said Mariusz Blaszczak, the Minister of Defence. As a result of the overhaul, T-72s full operational capability will be restored. The overhaul and modification of T-72M1 MBTs, although long awaited, is the subject of wide criticism. Mostly because of its very narrow scope, which will result in a

symbolic upgrade of their onboard equipment (although notable in regard to the current state) and no real improvement of combat strength or operational capability. As a result of its limited budget, which is the 'victim' of other more ambitious modernisation programmes launched by the MoD in recent years, the programme does not include, among other necessary modifications, the replacement of the platform's engines and transmissions (through the installation of a modern and highly efficient powerpack), stabilised cannon with a fire control system, new ballistic protection kits, such as the explosive reactive armour that is mounted on the modernised PT-91s, or procurement of new and more modern ammunition.

Photo: Polish MoD



**In late 2015 the Polish MoD signed a contract for the modernisation of the initial batch of 128 LEOPARD 2A4 MBTs to the 2PL standard. In 2018 the MoD decided to modernise 14 more 2A4s for PLN2.7Bn. The final batch of modernised LEOPARD 2PL MBTs should be delivered to the Polish Land Forces by 2021.**

The situation is even more controversial due to the fact that over the past few years the Polish defence industry has presented a number of modernisation proposals for the T-72M1 tank, most of which would lead to a vast increase of platform's operational capability. During last year's International Defence Industry Exhibition MSPO in Kielce, ZM Bumar Labedy showcased two prototypes of the modernised T-72M1/PT-91 MBT, called PT-91 M2A1 and PT-91 M2A2.

The first modernisation variant included an upgrade or replacement of the current onboard equipment or installation of new systems, such as for the chassis: 850-1000 HP engine with strengthened transmission, strengthened suspension system, Auxiliary Power Unit (APU) with DC-generator up to 10 kW, air-conditioning system with independent drive, an extended area protected by reactive armour, additional slat hull armour, improvement of anti-mine protection at the bottom of the hull, fire extinguishing and suppression system with DeuGEN agent, a driver's passive night vision periscope, a driver's day-night drive back camera, digital electronic supply, control and protection systems, modernisation of auto-loader system, and for the turret: modernised 125mm main gun (L48 MS-type), two-axis stabilised day-night integrated gunners sight, commander's day-night panoramic sight (Hunter-Killer/Killer-Killer mode) integrated with 12.7x99NATO module, digital stabilisation system, digital fire control system, Soft-Kill protection system with smoke grenade launchers, additional reactive armour, fire suppression system with DeuGEN agent and a digital internal, external communication system, integrated with BMS system.

The PT-91 M2A2 modernisation proposal, which was also showcased in Kielce, presented following upgrades including chassis: 1000-1200 HP engine with automatic transmission (Power-Pack), strengthened suspension system, Auxiliary Power Unit (APU) with DC-generator up to 6 kW and air-conditioning system, additional reactive armour, additional slat hull armour, improvement of anti-mine protection of the bottom of the hull, fire extinguishing and suppression system with DeuGEN agent, driver's passive night vision periscope, a driver's day-night camera with additional day-night reversing camera, digital electronic supply, control and protection systems, modernisation of auto-loader system, and turret: modernised 125mm main gun (L48 MS-type or 2A46M-4 type), two-axis stabilised day-night integrated gun-

ners sight, commander's day-night panoramic sight (Hunter-Killer/Killer-Killer mode), commander's passive day-night vision system (emergency situations), heavy machine gun 12.7x99mm NATO, digital stabilisation system, digital fire control system, Soft-Kill protection system with smoke grenade launchers, additional reactive armour, fire suppression system with DeuGEN agent and digital internal, external communication system, integrated with battlefield management system (BMS).

## Modernisation of the LEOPARD MBT

The presented modernisation options, regardless which of them would eventually be applied, could significantly improve T-72s firepower and operational capability. However, after months of negotiations and analysis, the MoD decided to abandon its original plans and limit the scope of contract works to simply restoring the platform's performance and conducting slight modifications of onboard equipment. Therefore, modified T-72M1 MBTs will not make a noticeable improvement to the country's defensive capability. However, they will allow the MoD to sustain a significant number of MBTs on active duty units and reserve force, as T-72M1s will supplement a fleet of LEOPARD 2 MBTs acquired from Germany in the past.

Back in 2002, Poland and Germany signed a contract for the procurement of 128 LEOPARD 2A4 MBTs from Bundeswehr's stocks as well as a number of auxiliary vehicles. These tanks were delivered to Poland in 2003. Another batch of 119 ex-German MBTs was acquired in 2013, when both countries reached an agreement about the transfer of 105 LEOPARD 2A5 and additional 14 2A4 tanks, which were subsequently delivered in 2014-2015.

In late 2015, the MoD signed a contract with a consortium of PGZ and ZM Bumar-Labedy, as well as a number of other public defence companies, like WZM, PCO, Zakłady Mechaniczne Tarnów, ROSOMAK, and OBRUM, for the modernisation of the original batch of 128 LEOPARD 2A4 MBTs to the 2PL standard. The contract's value was PLN2.4Bn. In 2018 the agreement was amended, and an annex regarding the modernisation of additional 14 2A4s, the ones which were procured in 2014-2015, was added after which the cost of the programme grew by some PLN300M.

Shortly after the original agreement was reached, ZM Bumar-Labedy entered into partnership with Rheinmetall Landsysteme GmbH. The German company was

supposed to design and implement the modernisation package on the first prototype vehicles, and eventually transfer the required technology and production rights to the Polish manufacturer. According to the latest estimates, the final batch of modernised LEOPARD 2PL, MBTs should be delivered to the Polish Land Forces by 2021.

According to ZM Bumar-Labedy, the list of modifications and upgrades which will be implemented in the 2PL variant include: new/upgraded observation and aiming sites for the commander and gunner, improved ballistic protection of the turret, new electronic system for turret traverse and cannon elevation, installation of more effective fire/explosion prevention system, new command and



**A Polish PT-91 TWARDY tank**

control system, additional APU generator, additional cargo carrying equipment and upgraded evacuation/towing system adjusted to the higher weight of the platform, new fire control system, new ammunition (DM63 antitank and DM11 multipurpose) and a day/night reverse camera for the driver.

## New Generation MBT

The overhaul and modification of the fleet of T-72M1 MBTs is described by the MoD as an interim solution, which is supposed to allow the Army to maintain a significantly high number of tanks in active duty units, until the new generation platform enters service. "(...) we all await and work for the start of construction of new generation tanks by the Polish defence industry," noted Minister Blaszcak.

Under the Wilk programme, the MoD intended to develop, either independently by the Polish defence industry or in co-operation with foreign partners, a new generation

MBT platform, which will be characterised by increased firepower, operability and combat capability in comparison to the currently used vehicles. "We are restoring manufacturing capabilities in regard to armoured vehicles technology. (...) Restoring this capability (...) is another step towards establishing of an industrial base for future works on the new main battle tank for the Polish Armed Forces," admitted Witold Slowik, President of the PGZ Management Board.

In May 2019, PGZ announced its intention to work on the new Polish MBT. "PGZ is launching a research and development programme on the new MBT for the Polish Army," declared Slowik during the European Economic Congress in Katowice. The group declared that it has the ability to develop particular equipment or subsystems

of the future platform, which, in the first place, will supplement the LEOPARD 2PL/A5 MBTs allowing for phasing out legacy T-72M1/PT-91 tanks, and eventually also replacing the former platforms.

Whether Poland will be able to independently design and develop a new generation MBT remains questionable. Due to limited capabilities of its own defence industry, it seems more reasonable to enter partnership with other European allies, which already work on such a platform, like to Franco-German Main Ground Combat System programme, where Poland could make a significant and valuable contribution. The other alternative, which is also not hard to imagine, is to design a new MBT from scratch, but based on the of shelf subsystems, like in the case of the 155mm Krab self-propelled howitzer. However, as much as in theory it would result in the development of a new combat vehicle, in reality it would still be a platform similar in performance to the ones that already are widely operated across Europe. ■

# UK Naval Acquisition Programmes

## Current Programmes and Future Prospects

**Conrad Waters**

The next year will be important for the UK Royal Navy's acquisition programmes and for the future of the domestic shipbuilding industry. Work on the new DREADNOUGHT class strategic submarines and Type 26 Global Combat Ships is starting to ramp up. However, major decisions will shortly be taken on other major projects.

The QUEEN ELIZABETH class aircraft carrier programme has provided a major boost to the UK's maritime sector but this is now rapidly drawing to a close. The direction taken in implementing new programmes will, therefore, determine

percent of national income (i.e. GDP) to defence, SDSR 2015 set out an increased £178Bn procurement programme across all three armed services over the following decade. Within this, key naval projects included:

value following the Brexit decision given significant purchases made in US dollars. By late 2018, the updated Defence Equipment Plan for the next decade was estimated to cost £193.3Bn against an allocated budget of £186.4Bn. The shortfall was particularly acute in the following four years. Whilst the naval programmes summarised above have largely been maintained, this difficult financial background is undoubtedly having an impact on procurement decisions.



Photo: Conrad Waters

*The first Batch II RIVER class offshore patrol vessel HMS FORTH arrives at the homeport of Portsmouth in February 2018. The class has helped fill shipyard capacity between construction of the QUEEN ELIZABETH and Type 26 Global Combat Ship classes.*

whether the vision of a revitalised industry set out in an ambitious National Shipbuilding Strategy is likely to be achieved.

### Acquisitions Background

UK naval procurement is currently being conducted under the framework of the Strategic Defence & Security Review 2015 (SDSR 2015). Scheduled every five years, these reviews broadly take a ten-year horizon and attempt to prioritise the allocation of likely resources to meet the greatest risks to national security. Committing at least 2

- Completion of the two QUEEN ELIZABETH class aircraft carriers;
- Completion of the ASTUTE class attack submarine programme and construction of a new generation of strategic submarines;
- Procurement of eight Type 26 Global Combat Ships;
- Acquisition of a new light frigate class, comprising at least five ships;
- Purchase of two additional offshore patrol ships;
- Construction of three fleet solid support ships to sustain aircraft carrier operations.

Although SDSR 2015 was generally well-received, it has suffered from the fundamental weakness that the funding allocated to procurement was insufficient to meet the likely cost of the material acquisitions planned. This weakness has been exacerbated by the decline in sterling's

### Submarines

Sustaining and modernising the Royal Navy's flotilla of four strategic and seven attack submarines – all equipped with nuclear propulsion – is by far its most expensive equipment commitment. Around £45Bn is allocated to the fleet's submarines over the decade from 2018/2019. More than double the £19.5Bn allocated to surface warships. The major element of this expenditure is replacing the four existing VANGUARD class submarines that carry the UK's nuclear deterrent with the new DREADNOUGHT class boats.

The need for a new strategic submarine class was heralded by the then Labour government's 2006 White Paper 'The Future of the United Kingdom's Nuclear Deterrent'. Following completion of the concept and assessment phases of what was known as the 'Successor' programme, the project moved to the first of a series of manufacturing phases following a parliamentary vote affirming the VANGUARD class's replacement in 2016. The programme is being managed by a new Submarine Delivery Agency established with the UK Ministry of Defence (MoD). The agency is part of a commercial alliance with BAE Systems and Rolls-Royce tasked with delivering the project in similar fashion to the way the Aircraft Carrier Alliance led the QUEEN ELIZABETH class programme. Babcock International will also play an important role by supplying equipment for and ultimately sustaining the new submarines.

### Author

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First, steel cutting for DREADNOUGHT took place at BAE System's Barrow-in-Furness yard on the UK's north-west coast early in October 2016. She will be followed by three additional units to replace the VAN-GUARD class on a one-for-one basis. Each of the c. 17,200-tonne submarines will be constructed in 16 blocks, which will then be grouped into three mega-units for the overall efficiency of assembly. The boats incorporate a Common Missile Compartment that will be shared with the US Navy's new COLUMBIA (SSBN-826) class strategic submarines. While each DREADNOUGHT will be fitted with three, quad pack missile tube modules for the Trident II D15 missiles that form their main armament, only eight missiles will be carried operationally. Other key elements of the new submarines' design include a new generation PWR-3 nuclear reactor, turbo-electric propulsion and a combination of hydroplanes and rudders in an 'X' shaped tail configuration. They are the first Royal Navy submarines to be built with separate crew accommodation for women.

The new submarines are due to become operational by the early 2030s onwards. The planned service lives of the VAN-GUARD class have already been significantly extended to ensure continuous maintenance of the deterrent so there is inevitably considerable focus in ensuring the programme's schedule remains on track. BAE Systems' record in delivering the previous ASTUTE class attack submarines has been less than exemplary. The first three members of the class were delivered late and over budget due largely to difficulties in recovering lost industrial skills following the slowdown in submarine construction following the end of the Cold War. Four further ASTUTES are currently in various stages of construction at Barrow, with the fourth boat – AUDACIOUS – still to commence sea trials as of July 2019 over two years after its launch. The cost to complete these four submarines is currently forecast to be £6.9bn, around £1bn more than estimated when they were first approved. Whilst the DREADNOUGHT programme was formally reported to be on track and on budget, as of the end of 2018, there is clearly no room for complacency given this background.

## Type 26 Global Combat Ships

The Royal Navy's second largest procurement programme is for eight new, frigate-like Type 26 Global Combat Ships. Tracing its origins to concept studies on replacements for the Type 22 and Type 23 frigates during the mid-1990s, the Type 26 programme

had an extremely long gestation period that was finally brought to an end with the signature of a £3.7bn manufacturing contract for the first three units in July 2017. Orders for the remaining five ships will substantially increase this figure when they are placed in the early 2020s. The first ship is to be named GLASGOW and the others have all been assigned the names of major conurbations. Accordingly, the class is known as the 'City' class in the Royal Navy.

The Royal Navy Type 26s are being built at BAE Systems' Govan and Scotstoun yards sites on the River Clyde in Glasgow. Govan undertakes initial fabrication and assembly up to the float out stage whilst Scotstoun – located a few miles downriver – is the focal point for final outfitting, systems commission and acceptance. A similar process was used for the later Type 45 DARING class destroyers and refined during the construction

of auxiliary systems. Other key design elements include an open access, common computing infrastructure for combat, communications and ship management systems and a large mission bay just forward of the hangar that can be used to ship a wide variety of equipment dependent on particular mission requirements.

The Type 26 Global Combat Ship concept was specifically designed with exportability in mind, albeit navies with the budget to afford such a sophisticated ship are inevitably limited. The design scored its first major success with its selection for the Royal Australian Navy's SEA 5000 frigate programme at the end of June 2018. Subsequent signature of an advanced work arrangement in October 2018 was quickly followed by conclusion of an overall framework agreement for the design and build of the nine ships. Deliveries will commence around 2027 and stretch well into the 2030s. Construction is



Photo: BAE Systems

**Construction of the first Type 26 CITY class frigate for the Royal Navy commenced on the River Clyde in 2017. The UK plans to buy eight of the class.**

of the five Batch II 'River' class offshore patrol vessels that have helped bridge the gap to the commencement of Type 26 production. The fact that FORTH, the first of the new batch of 'Rivers' suffered from significant construction problems that delayed its entry into operational service demonstrates the wisdom of trialling the process before starting work on the more complex frigates.

Displacing nearly 7,000 tonnes, the c.150 m long Type 26 design is a multi-mission warship with a particular emphasis on anti-submarine warfare operations in high-intensity scenarios. This is reflected in efforts to reduce acoustic signature. These extend to the low-noise hull design, the configuration of the combined diesel-electric or gas (CODLOG) propulsion system and a focus on minimising the sound generated by aux-

iliary systems. Other key design elements include an open access, common computing infrastructure for combat, communications and ship management systems and a large mission bay just forward of the hangar that can be used to ship a wide variety of equipment dependent on particular mission requirements.

The Global Combat Ship design also formed the basis of a proposal from Lockheed Martin Canada that was selected as the preferred option to meet a requirement for 15 new Canadian Surface Combatants in October 2018. The ships will be built by Irving Shipbuilding, Halifax as prime contractor in line with the tenets of Canada's National Shipbuilding Strategy. Irving was awarded an initial contract to develop the design in February 2019, with much of this flowing through to Lockheed Martin and BAE Sys-



BAE Systems

**The Royal Australian Navy selected a variant of the Type 26 – equipped with a different combat system and sensors – to meet its requirement for nine frigates. The ships will be known as the HUNTER class.**

tems. Lockheed Martin Canada will supply a variant of its CMS 330 combat management system already used in Canada’s HALIFAX class and a new active phased array. However, much of the rest of the platform and propulsion architecture will again be common with the Royal Navy variant. As such, there will be significant benefits both to BAE Systems as initial designer and to a wider UK maritime supply chain that is now start-

ing to deliver equipment for the first Royal Navy ships.

### QUEEN ELIZABETH Class Aircraft Carriers

The ramp up of construction activity on the Type 26 programme comes as work on the QUEEN ELIZABETH class aircraft carrier project is rapidly drawing to a conclusion.

QUEEN ELIZABETH has now been in commission for nearly two years and returned to its building yard in Rosyth near Edinburgh for its first docking period in April 2019. She is scheduled to continue operational testing with F-35B LIGHTNING II strike fighters off the eastern coast of the US in the second half of 2019. The declaration of initial operational capability in the strike carrier role will follow before the end of 2020. Its partner ship, PRINCE OF WALES, remains at Rosyth undergoing harbour acceptance testing but will commence sea trials before the end of the year.

The construction of the two QUEEN ELIZABETH class aircraft carriers has provided a major boost for the UK maritime sector. The use of block assembly techniques spread the benefits of the £6.3Bn programme across a number of shipbuilding yards, rebuilding experience and worker skills across the country. Some facilities have already used this expertise to help broaden their business into new areas, one example being Mersey-based Cammell Laird’s construction of the new polar research ship SIR DAVID ATTENBOROUGH for the British Antarctic Survey. The question is how to ensure these skills are retained across the sector now that carrier-based work has dried up. Two yards involved in QUEEN ELIZABETH class construction – Babcock’s Appledore yard in North

## Current & Planned UK Royal Navy Warship Acquisition Programmes

Submarines							
Class	Type	Displacement	First Ordered	Total	Completed	Ordered	Planned
ASTUTE	Nuclear-powered attack submarine (SSN)	c. 7,500 tonnes	1997	7	3	4	0
DREADNOUGHT	Nuclear-powered strategic submarine (SSBN)	c. 17,200 tonnes	2016	4	0	1	3

Surface Vessels							
Class	Type	Displacement	First Ordered	Total	Completed	Ordered	Planned
QUEEN ELIZABETH	Aircraft Carrier (CV)	c. 65,000 tonnes	2008	2	1	1	0
Batch 2 ‘River’	Offshore Patrol Vessel (OPV)	c. 2,000 tonnes	2014	5	2	3	0
Type 26 ‘City’	Frigate (FFG)	c. 7,000 tonnes	2017	8	0	3	5
Type 31e	Frigate (FF)	c. 4,000 tonnes	Planned	5+	0	0	5+

Auxiliaries [1]							
Class	Type	Displacement	First Ordered	Total	Completed	Ordered	Planned
Solid Support Ship	Replenishment Ship (AFS)	c. 40,000 tonnes	Planned	2 [2]	0	0	2 [2]

Notes:

1. Auxiliary ships are not considered as ‘complex’ and are, therefore, eligible for construction overseas.
2. Plus one option.



Devon and BAE Systems' Portsmouth facility – have already closed.

In September 2017, the UK government published a National Shipbuilding Strategy (NSS) to help answer this question. Drawing on an earlier report commissioned from the respected naval industrialist, Sir John Parker, it looked to build on the legacy of QUEEN ELIZABETH class procurement to secure a larger and more sustainable shipbuilding sector. Key elements of the strategy included the adoption of a more disciplined and co-ordinated government approach to warship procurement, an increased focus on exports and the utilisation of the skills acquired by regional shipyards to establish a cost-effective, virtual shipbuilding model based on distributed block build.

Photo: BAE Systems



**A second export success for the Type 26 Global Combat Ship design was its selection as the basis for the Canadian Surface Combatant programme. As with the Australian ships, combat management system and sensors will be revised to meet specific Canadian requirements.**

## Type 31e Frigates

The NSS envisaged the planned new light frigate programme – the Type 31e – acting as a pathfinder for the desired new approach to warship procurement. Initiated by SDSR 2015, Type 31e was intended to reduce some of the financial pressure on the shipbuilding budget by replacing five of the 13 Type 26 Global Combat Ships that had initially been envisaged by a new class of flexible and – importantly – cheaper general purpose frigates. In essence, the existing Type 45 destroyers and Type 26 frigates were to be focused on high end tasks, leaving the new class to take care of less intensive maritime security and defence engagement roles. It was also hoped that the new design would have broader export potential than the expensive Type 26, reflected in the 'e' for export suffix in the type designation. The programme to acquire the Type 31e was formally launched on 7 September 2017, the day after the NSS was published.

A request for information (RFI) released later the same month provided further details on key Type 31e programme requirements. These were to:

1. Deliver five ships, the first to enter service in 2023;
2. Achieve a unit price of £250M, including development cost, risk and profit;
3. Accept a fixed price contract;
4. Maximise UK prosperity and exportability, without compromising on cost or time;
5. Develop an adaptable, modular design that would be attractive to export markets;
6. Use a UK-focused design and build strategy maximising UK content;

In spite of the requirements relating to the UK's design and build strategy, it was hoped to encourage international compa-

Photo: Crown Copyright



**The new aircraft carrier QUEEN ELIZABETH undertaking trials with the F-35B LIGHTNING II strike fighter off the US coast in 2018. The carrier programme will soon be completed with delivery of its partner ship PRINCE OF WALES.**

nies to compete for the programme. Compared with the clear pricing and time-scale objectives, the technical specifications mandated in the RFI were relatively sketchy. The basic approach was to achieve a relatively modest minimum threshold in terms of armament and general capability. However, the design would need to be sufficiently adaptable to allow this threshold to be significantly exceeded dependent on the specific requirements and budgets of export customers. There was more precision with respect to the desired communi-

cations and sensor fit, whilst an endurance of at least 6,500 nautical miles at an economical speed and a minimum maximum speed of 24 knots were clearly influenced by the demands of global deployments. Accommodation was to be provided for 140 crew and supernumeraries. It was considered that the requirements could be met by a ship displacing around 4,000 tonnes and with a length of c. 120 metres. The original timescale for the Type 31e programme envisaged a number of competitive design contracts being awarded early in the



Photo: Conrad Waters

**The MEKO A-200 SAN frigate AMATOLA pictured at Portsmouth, UK in 2018. The MEKO A-200 design forms the basis of Atlas Elektronik UK's proposal for the Type 31e programme.**

second quarter of 2018. These would be followed by the selection of a preferred proposal before the end of 2018 and contract signature early in 2019. Unfortunately, this timeline has proved impossible to adhere to. In July 2018, the MoD's Equipment & Support agency announced a pause in the programme due

to insufficient compliant bids being received to run an effective and robust competition. Speculation at the time suggested that the project's requirements with respect to cost, timescales, intellectual property transfer and risk were simply too great for potential bidders to accept.



Photo: Babcock International

**The Babcock International-led consortium's 'Arrowhead 140' design proposed for the Type 31e project is based on OMT's IVER HUITFELDT class design.**

The procurement programme resumed at the end of August 2018. There have subsequently been rumours that a number of requirements have been eased to make participation more palatable for potential contractors. Many of these suggest that the cost envelope has effectively been expanded by provision of more government-supplied equipment than was initially the case. Whatever the truth, competitive £5m design contracts were awarded to each of three consortia headed by Atlas Elektronik UK, Babcock International and BAE Systems in December 2018. These resulted in the submission of formal design and build proposals towards the end of June 2019. A winner will be announced by the end of the year. Publicly available information on the three competing proposals reveal significant differences in design and build strategy. More specifically:

- Atlas Elektronik UK has proposed a variant of parent company ThyssenKrupp Marine Systems' MEKO A-200 design already in service with the Algerian and South African fleets. Construction would be carried out by Harland & Wolff in Belfast, supported by Ferguson Marine on the Clyde.
- The Babcock International led 'Team 31' has put forward the 'Arrowhead 140' design derived from the Danish Odense Maritime Technologies' (OMT's) IVER HUITFELDT class platform. The UK's BMT has helped customise the design for Royal Navy use whilst Thales will be combat systems integrator. Construction would be at Babcock's Rosyth yard with the support of blocks constricted by Harland & Wolff and Ferguson Marine.
- BAE Systems has submitted an enlarged variant of the corvette design used for Oman's Project 'Khareef' that would be built by Cammell Laird on the River Mersey as part of the 'Team Leander' alliance. A&P Group's yard on the Tyne would probably be involved in block construction work.

The merits of the three proposals are finely balanced. While Atlas Elektronik's proposal offers a capable and well-proven platform design, there are inevitable questions about the availability of intellectual property rights for export contracts and the relevant experience of its shipyard partners. Babcock's design is also proven and offers significant margin for growth but may be larger than the Royal Navy's requirement. Conversely, BAE System's LEANDER has limited upgrade margins and is less-well proven. However, it would be built by an experienced shipbuilding alliance and its

English provenance might have political benefits given continued calls for Scottish independence as the UK prepares for Brexit.

## Fleet Solid Support Ships

The other major UK naval procurement programme awaiting contract award is that for two or three fleet solid support ships for the Royal Fleet Auxiliary. Destined to replace the existing 'Fort' class auxiliaries, they will operate in conjunction with the new 'Tide' class fleet tankers and provide the QUEEN ELIZABETH class carriers with ammunition and other solid stores. The new ships will be large and complex vessels of 40,000 tonnes displacement. This is reflected in a likely contract value of around £1Bn, only a little less than that allocated to the initial Type 31e programme.

As the ships have not been designated as warships under UK naval procurement rules, the competition for their design and build has been opened up to international competition. Construction of the previous 'Tide' class was carried out by Daewoo Shipbuilding & Marine Engineering (DSME) in South Korea, albeit to a British BMT design. Although delivery was delayed by a number of detailed build issues, the 'Tide' class programme was delivered competently and below what was already a very competitive price. However, the availability of surplus UK shipbuilding capacity now that the QUEEN ELIZABETH class programme has run its course has led to increasingly vocal calls to construct the new ships domestically in support of the NSS's vision of a revitalised domestic industry. To some extent, it would seem there is a trade-off between short term cost and longer term industrial gain.

In November 2018, the MoD announced that five groups had been selected to compete for the contract. Four of the bidders – DSME, Italy's Fincantieri, Japan Marine United Corporation and Spain's Navantia – were international companies. The fifth, Team UK, was a UK consortium comprising Babcock, BAE Systems, Cammell Laird and Rolls-Royce. Subsequent reports suggest that both DSME and Fincantieri have withdrawn from the bidding. If successful, it would seem likely that Team UK would use the Rosyth building berth recently vacated by the QUEEN ELIZABETH to assemble the support ships, with Cammell Laird and BAE Systems – and potentially other yards – supporting with block build and systems integration. A decision on the way forward is expected in the first half of 2020.

Photo: Crown Copyright 2019



**Two TIDE class fleet tankers on exercises with the AOR FORT VICTORIA in 2019. The proposed fleet Solid Support Ships will operate alongside the TIDEs and replace the elderly FORT class vessels.**

Foto: BAE Systems



**BAE Systems has allied with Merseyside's Cammell Laird for its Type 31e proposal, which is based on the LEANDER design concept.**

## Conclusion

The UK's naval acquisition programmes reflect a relatively buoyant picture. In particular, the DREADNOUGHT strategic submarine and Type 26 Global Combat Ship programmes seem destined to provide a steady flow of work for BAE Systems' Barrow-in-Furness and Clyde shipyards well into the 2030s. The picture for the broader domestic shipbuilding sector is less certain, with the conclusion of the

large QUEEN ELIZABETH class carrier programme reflected in a run down in activity in a number of other facilities. The NSS provides a vision of how the benefits provided by the QUEEN ELIZABETH class programme can be sustained across the broader maritime sector in the longer term. The extent to which this vision is realised will depend on the decisions taken with respect to the Type 31e and Fleet Solid Support Ship contracts in the months ahead. ■

# German Naval Programmes

**Dieter Stockfisch**

Today, national and Alliance defence once again sets the standard for the equipment and training of the German Navy. At the same time, the German Navy is equally involved in international crisis management and conflict prevention.

In addition, together with its international allies and partners, it should guarantee the freedom of the seas. And as an Alliance navy, it regularly participates in the four standing NATO Maritime Groups. However, it is impossible to predict today how the global maritime security situation will develop and what this will mean for the Navy. The Navy must, therefore, prepare itself for a wide range of possible tasks, from police-like and humanitarian tasks in the field of crisis management to naval warfare within the framework of country and Alliance defence. This brings along an increasing range of tasks and missions for the Navy, which requires more modern ships, boats, aircraft, equipment and personnel.

Photo: Airbus Helicopters



**18 SEA LION naval helicopters will be procured to replace the ageing SEA KING fleet.**

## Growth and Modernisation of the Fleet

The German Navy can be deployed on a global scale, is highly flexible and has one of the most modern fleets in the world. This not only applies to innovative management and command systems, but also to the technologies implemented. At the same time, technological progress and digitisation are forcing the Navy's management to continuously modernise its fleet. Today, the German Navy is subject to its most comprehensive modernisation process since it was founded. The shrinking process of the German Navy after the end of the Cold War in 1990 has come to an end. Over the next decade, the Navy will receive one to two new powerful ships or boats and new helicopters every year.

The modernisation of the fleet comprises the four Class 123 frigates (BRANDENBURG Class), the software elements of

Photo: German Navy



**The eight P3C ORION MPAs of the German Navy are being fundamentally modernised.**

which, above all, are upgraded to become state of the art. For the three Class 124 frigates (SACHSEN Class), the radar, including the software components of the anti-air warfare system, will be replaced and upgraded. In future, these frigates will be able to locate and detect exoatmospheric ballistic missiles and transmit these target data in real time to other ships engaging the missiles.

## Naval Aviation Component

The eight P3C ORION maritime reconnaissance aircraft will be equipped with new wings and avionics. In the medium

term, the plans are to develop a successor aircraft together with France. From November 2019, 18 new SEA LION helicopters (MH) will be delivered to the Navy. These brand new helicopters will replace the 21 over 40-year-old SEA KING Mk 41 helicopters. The NH90-NTH (Naval Transport Helicopter) SEA LION will be used as a search and rescue helicopter, as a transport helicopter for personnel/special forces and as a material transporter. It is equipped with a comprehensive range of sensors for the maritime environment. These include a maritime radar system, an electro-optical system with TV camera and infrared sensor, as well as a laser

## Author

**Capt. Navy (ret.) Dieter Stockfisch**

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range finder. A system for the detection and identification of electromagnetic emissions, including the radar warning functionality, will also be available. Another sensor is the AIS (Automatic Identification System) functionality to support the maritime situational awareness. Chaff/flare decoys are used as protection components. In addition, two M3M heavy machine guns can be fitted as active self-protection components. The use of modular ballistic protection equipment for crew and cabin comes as an option. The Mk 88A SEA LYNX helicopter on-board the Navy's frigates is currently still the organic flying component (sensor and weapon platform), primarily for ASW deployments. These aircrafts will have reached the end of its service life by around 2025. According to the Integrated Planning Process (IPP) the procurement process for a replacement has already started.

Photo: UMS Skeldar



**The SKELDAR UAV is undergoing tests and evaluation on board the K130 class corvette BRAUNSCHWEIG.**

## Ships and Boats

### F125 Frigates

Currently, four new F125 frigates (BADEN-WÜRTTEMBERG Class) have started deliveries. The FoC BADEN-WÜRTTEMBERG

(F222) entered service on 17 June 2019. The second frigate NORDRHEIN-WESTFALEN (F223), is scheduled for delivery by the end of 2019. The third and fourth frigates, SACHSEN-ANHALT (F224) and RHEINLAND-PFALZ (F225), are to be delivered by 2021. The F125 frigates are built

by ARGE F125 (Arbeitsgemeinschaft), a consortium of thyssenkrupp Marine Systems and Fr. Lürssen Werft.

With the F125 frigates, the Navy has broken new ground because they are ships designed from scratch. With their highly complex systems and approx. 28,000

# GERMAN NAVAL YARDS



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Image: MTG



**Artist's impression of the MKS 180 multi-role combat ship**

Photo:PIZM



**The replenishment ship RHÖN was taken into service in 1974 and should be replaced by 2021.**

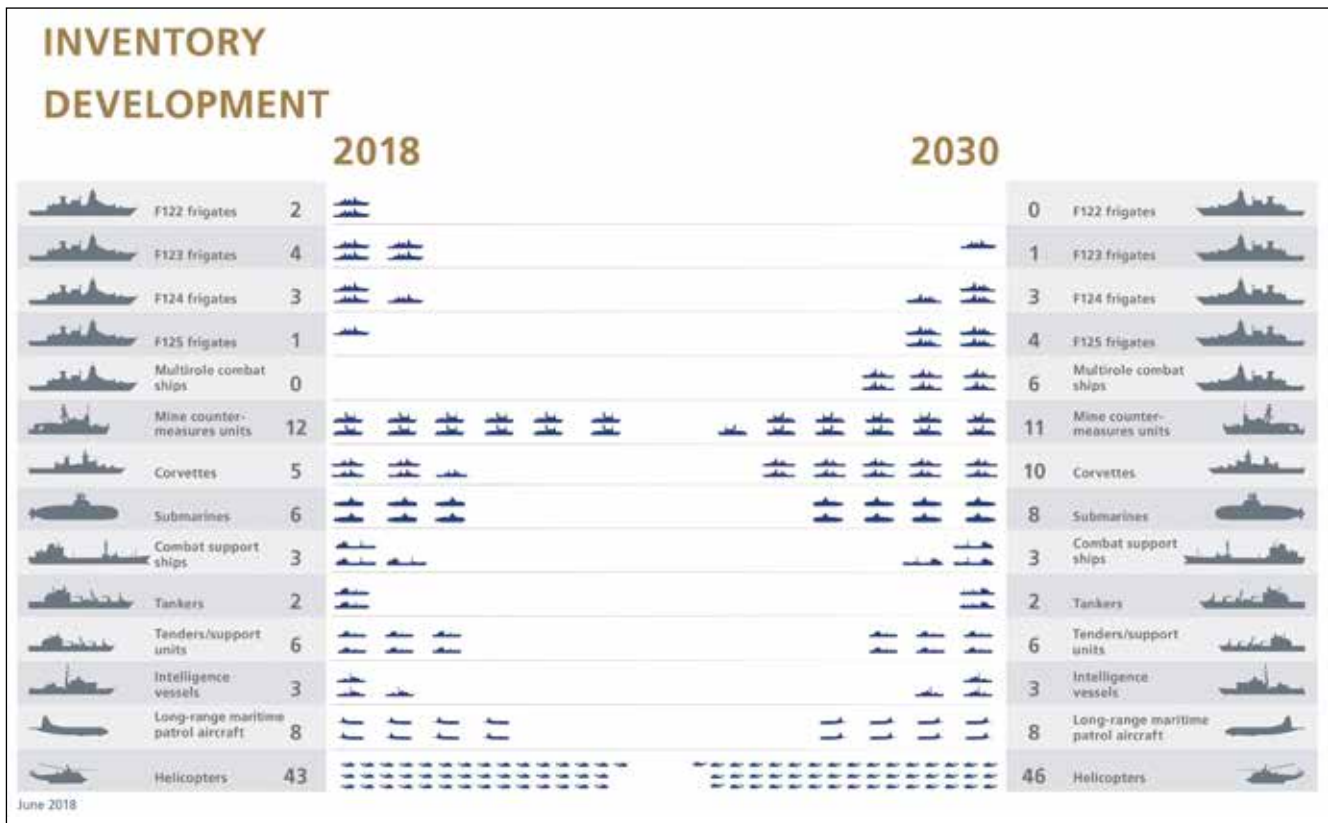
sensors, they feature a very high degree of automation, which makes it possible to halve the number of crews compared with previous frigates. The F125 crew comprises 120 staff. In addition, 70 special forces can be embarked. Approximately 90 per cent of the highly complex systems on board the F125 were newly

developed specifically for this class of ship. The F125's intense usability is characterised by a high degree of automation and low-maintenance systems (extension of maintenance intervals) as well as the multi-crew concept. This allows the F125 to operate continuously for up to two years. For the first time, the Navy has in-

troduced the CODLAG (Combined Diesel eLectric And Gas Turbine) drive on these frigates. The propulsion system consists of two electric motors each with 4,500 kW, a gas turbine with 20,000 kW and four diesel generators each with 2,900 kW. The cruising speed is 20 knots, the maximum speed is in excess of 26 knots, and the range is approx. 4,000 nm/18 knots. The sea endurance is 21 days. In addition, the F125 carry four rescue RHIBs (Rigid Hull Inflatable Boats) and has two spaces to accommodate containers on the middle deck. The RHIBs can carry 12 to 15 persons (special forces), reach a speed of 40 knots and have a range of 130 nm/20 knots. Depending on the mission, they can be armed with four heavy machine guns (12.7 mm) and grenade launchers. The boats are used for boarding missions, transport tasks, SAR (Search & Rescue), landings or even escort missions and patrols.

The 149.60 m long F125 frigates displace approx. 7,200 tonnes and are capable of comprehensively countering asymmetric threats, providing extensive tactical fire support for landing units, accommodating or supporting special forces and commanding international units. The frigate is able to carry out maritime operations





#### Expected German Navy inventory development from 2018

ranging from humanitarian aid and evacuation operations to combat operations. A novel sensor and weapon concept provides flexible and scalable options for action. The weapons and sensor systems are primarily designed for the self-protection. Almost all weapons on board are remote-controlled. In addition, there are automatic surveillance systems and extensive protection and effect capabilities against asymmetric threats. The 127-

mm gun, an outstanding weapon system, constitutes the largest gun calibre in the German Navy. The gun can engage targets at sea and ashore. The standard ammunition gives the gun a range of approx. 60 km, using GPS-guided special ammunition (VULCANO) approx. 120 km. Further armament items include eight x HARPOON anti-ship missiles, two x 27-mm light naval gun, five x 12.7-mm machine gun, two x RAM air defence sys-

tem and four x MASS decoy launchers. The spacious frigate has a large helicopter landing deck with a double hangar for accommodating and operating two SEA LION helicopters. The crews are regularly exchanged on site in the area of operation. By engaging eight crews (multiple crew concept) for four ships, the crews' terms in the theatres of operation are only four months long. The decoupling of crew and ship

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derived from the intensive use and the multi-crew concept leads to a significantly higher availability of the F125 in the field of operation.

**MKS 180 Multi-Role Combat Ship**

As a new type of combat ship, the Navy intends to procure six multi-role combat ships Class 180 (MKS 180, possibly re-designated F126 when in service). This ship is specially designed for high-intensity naval warfare. The MKS 180 is to have a broad spectrum of basic capabilities for assertion against surface, air and submerged threats, against asymmetric threats and for survivability and self-protection. The corresponding armament (guns and missiles) and equipment should enable the engagement of asymmetric targets at very close ranges, air targets at close range, sea targets at long range and submerged targets using the on-board helicopter. The ship is a further development of the F 125, but the expanded capability spectrum is achieved, even more consistently than with the F 125, through increased intensive use, mission modularity, multi-crew concepts, increased endurance and reduced life cycle costs.

**K130 Corvettes**

On 25 April 2019, the first of five new Class K130 corvettes designated KÖLN (2nd batch) was laid on keel at the Peene shipyard in Wolgast, which belongs to the Lürssen Group. The first five units have been in service since 2008 and have since proven themselves success-



Photo: Arge F125

**The frigate BADEN-WÜRTTEMBERG, FoC of the F125 class, entered service on 17 June 2019.**

fully in national and international missions. The construction of five additional corvettes worth 2.5 billion Euro, which was approved surprisingly quickly by the German Bundestag in 2017, comprises design services, manufacturing, and integration of all systems, equipment, and plants, also including the necessary land and training facilities as well as comprehensive logistics and services (technical documentation, training of crews). Delivery to the German Navy is scheduled for November 2022 and all five corvettes are to be delivered by 2026. In order to take account of the current state of laws and regulations and to keep pace with technological progress, selective changes have been made to the original

designs of the first batch of the K130. For example, the 6.25-metre rescue boats will be replaced by faster 7.5-metre rescue boats that have since been introduced by the German Navy. In addition, the IT security regulations currently in force in the Bundeswehr will be taken into account and implemented. The rapid further development of the technology with associated obsolescence also requires adaptations, changes and modernisation efforts, especially with regard to the command and weapon control systems (CWCS). Finally, the corvettes are to be equipped with UAVs (Unmanned Aerial Vehicles) for sea reconnaissance. The FoC BRAUNSCHWEIG has already been equipped with a SKELDAR UAV for test and evaluation.

**Submarines**

The 'German-Norwegian Submarine Cooperation' provides, among other things, for the joint development and procurement of six Class 212 CD (Common Design) submarines (four boats for Norwat and two units for Germany), their joint operation and training of personnel. These new-generation submarines are derived from the German Class 212A 2nd batch design. They have a fuel cell-based air independent propulsion system, are designed with consistent stealth technology and have the same innovative developments as the German Class 212A submarines (U35 and U36). These include, a diver's sluice for the inward and outward transfer of combat swimmers, pressure-resistant transport containers for the equipment of special forces (Special Operations), improved sensor technology and communication (networked operations) and increased mobility. They

Photo: Fr. Lürssen Shipyard



**The LUDWIGSHAFEN entered service in March 2013 as the fifth and last unit of the first batch of K130 class corvettes.**





Photo: tkms

**The U36 212A class submarine. The class 212 CD design will be based on and derived from the configuration of the 212A second batch.**

are to be deployed worldwide, above all in Arctic waters. The submarines are to be delivered to Germany and Norway between 2025 and 2030.

**Future Projects**

Future projects of the German Navy include eleven new mine countermeasure systems developed jointly with European naval partners to replace today's ten MCMV units, the FRANKENTHAL Class minehunters. In the European Defence

Agency (EDA), the European naval partners have come together to jointly plan the maintenance of capabilities in mine warfare and to stimulate joint procurement. However, different conceptual ideas on MCM still prevent agreement on a common system. The ideas of the German Navy are based on the high protection of the MCM unit combined with modular deployment of unmanned systems (underwater drones). The procurement of far-reaching UUVs (Unmanned

Underwater Vehicles) for MCM missions is also planned.

In addition, the Navy will have to procure two new fleet replenishment ships, as the outdated and repair-prone Class 704 fuel transporters RHÖN and SPESSART (which were put into service in 1974) can no longer respond to current needs and requirements. In addition, as monohull tankers, they may only be used until 2021 in line with IMO (International Maritime Organization) regulations for military units. It is understood that their replacement is absolutely imminent.

The procurement of eight small combat boats for the special forces of the Navy as well as new boats for training purposes is planned. In the medium term, the Bundeswehr Technical Centre for Ships and Naval Weapons, Maritime Technology and Research (WTD 71) will need new measuring and test boats. And, last but not least, the Navy's sail training ship GORCK FOCK will not be decommissioned, but will be preserved despite the high refurbishment costs of 135 million euro incurred by the German Navy and be operational in 2020. ■

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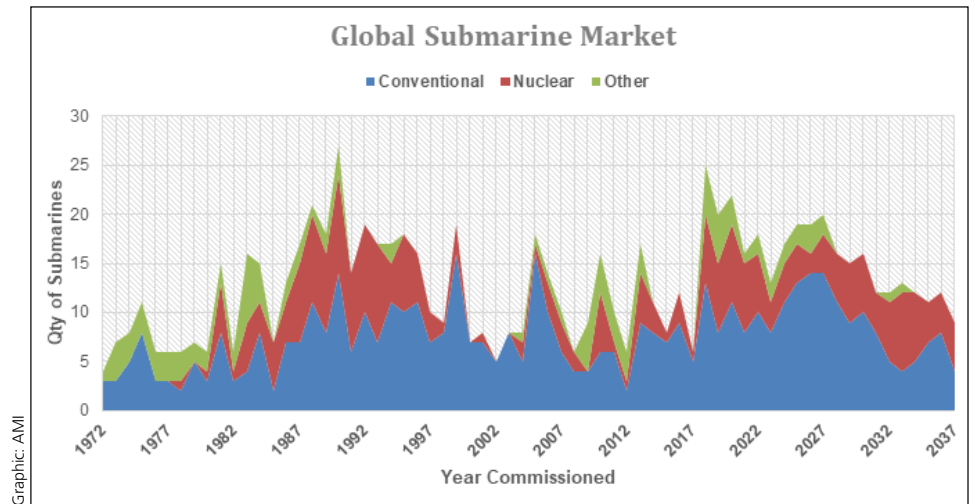
# European Submarine Requirements

**Bob Nugent**

More than a century after its debut, the submarine remains a key capability among the world’s navies and an area of continuing investment and technological development. Over forty navies worldwide have submarines in their fleets, and the number of submarine operators appears set to grow.

Submarines remain an attractive investment as more navies seek the combination of stealth and resulting strategic leverage that a small submarine force – even a single hull – can deliver.

Europe continues to be a world leader in submarine construction and operation, especially with regard to conventional submarines. Europe’s submarine builders in Germany, Sweden, Spain, France, and Italy supply domestic markets, and many of these yards export to markets around the world, from the Asia-Pacific to South America. As several new construction submarine programs in Europe are now underway or are expected to contract over the next 1-2 years, the region’s submarine market is worth a closer look.



Graphic: AMI

## The Global Submarine Market

This article reviews submarine requirements and building programmes in Europe, including both NATO member countries and other navies, but not including Russia. After a review of global trends in submarine construction, the article will assess European submarine programs as a whole in the context of the world market, and close with additional details on European submarine programs building now and expected in the future. It draws on proprietary market and technical information provided by AMI International, for over 30 years a provider of insights to those involved in the naval market. The chart

above (presented by AMI at the 2018 UDT conference in Glasgow, Scotland) shows that the global submarine construction market has shown a consistent pattern over the past 50 years. With an average of 30 years of hull life, submarine building has shown a pattern of periodic “surge production” to replace blocks of submarines that reach their end of service lives. The last such surge in conventional-power (diesel propulsion plants) submarines marked the end of the Cold War and the following decade, when many programs designed for Cold War requirements were executed.

Submarines built in those years are now going out of service, and a number of new replacement submarines are forecast in another surge of new submarines to be built and put in service over the next 10-15 years. This is especially true in Europe (specifically NATO countries in Europe).

The global submarine force today comprises a small percentage of total platforms in service worldwide. The 456 submarines tracked by AMI in its Existing Ships Database are only 3% of ships and craft in service. However, those 456 submarines absorb a significant portion of the ship construction, repair and maintenance, and operational resources in naval budgets. Further the specialized demands of submarine operation require an ext-

raordinary investment to recruit, train and keep officers and crew proficient. While 13 European navies continue to operate submarines, the resource-intensive nature of the platform have pushed some countries, like Denmark, Croatia and, Bulgaria, to retire their submarines from active service. Others, like Romania, retain at least some submarine capability

Existing Naval Market (Ships currently in Navy or Coast Guard service)	Submarine	Total Hulls
Asia & Australia	165	4090
Caribbean & Latin America	25	1304
Middle East & North Africa	43	1444
NATO	84	2330
Non-NATO Europe	5	399
Russia	62	889
Sub Saharan Africa	3	324
USA	69	767
<b>Totals</b>	<b>456</b>	<b>11547</b>

## Author

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(single hulls) but would need to redirect resources to make that capability operational. Portugal and Greece are examples of countries that operate capable submarine forces but face near-term resource investment decisions to maintain existing sub fleets, since they have no new construction submarine programs currently planned.

Another characteristic that shapes European submarine forces today is the great variation in operational environments. The littoral Baltic and Black Seas are substantially different in maritime geography and acoustic characteristics compared to the wider expanses of the Mediterranean, North, Arctic and Atlantic waters. And as European navies plan for increased submarine operations beyond “home” waters as part of NATO or other multi-lateral operations, requirements for platforms and systems that can adapt to these variations in operating environments are growing.

Looking ahead, while AMI forecasts that Asia-Pacific region has the largest demand for new submarines (about 40% of the global forecast) to be built through 2040, NATO Europe comes in second, with about 20% of the forecasted global build. If realised, this build rate will keep NATO navies’ submarine forces at about the same share of the world’s operational submarine fleet that is the case now.

Of the over 50 new European submarines building in these programmes, most (62%) are conventional or AIP propulsion submarines displacing about 2000 tonnes fully loaded.

The armament of these submarines is an area of intense scrutiny, especially with

Photo: Navantia



**Commissioning of the new Spanish S-80 submarines has been delayed due to technical difficulties.**

regards to capabilities to employ long range anti-ship or land attack missiles. France’s BARRACUDA class SSN will employ a Naval version of the Système de Croisière conventionnel Autonome a Longue Portée Propulsée (SCALP) programme, with ranges reported at over 400km (222 NM). The UK ASTUTE class is capable of launching Tactical TOMAHAWK (Block IV) missiles. Spain’s S80 class is assessed as having the capability to launch Boeing HARPOON anti-ship missiles (ASMs) and tactical land attack missiles (T-LAM). The latter missile is not currently in the Spanish Navy’s arsenal. Poland’s new submarine program has seen proposals from offerers to provide a missile launch capability on the platform.

Another capability area receiving more attention is the employment of unmanned underwater vehicles (UUVs). To date, such capabilities are concentrated on tactical UUVs launched and recovered from existing manned submarine platforms. The Swedish A26 design features a multi-mission portal for the launch of UUVs. The German Type 212 and 214 designs could deploy torpedo hull form UUVs via existing torpedo tubes.

No information has emerged that European navies are considering UUVs of sufficient size to operate independently, using designs and operational concepts similar to those developed by the US Navy in its XLUUV and LDUUV programs.

Air Independent Propulsion (AIP) is another submarine capability seeing significant development. The German Type 212A design has a hybrid AIP fuel cell/

battery propulsion plant. The design retains a conventional diesel-electric propulsion system to charge batteries that can support high-speed operations, while adding the AIP capability that can recharge the battery and support extended low-speed operations. HDW estimates that the Type 212A will be able to remain submerged for several weeks and cruise (at four knots) for over 3,000nm. The AIP system is based on the polymer electrolyte membrane (PEM) fuel cell technology that was developed jointly by HDW and Siemens AG.

As noted below, the AIP system on the Spanish S80, reportedly a three-hundred-kilowatt PEM fuel cells developed by UTC Power, has experienced some technical issues.

Looking at budget and acquisition cost, conventional (SSK) submarines group around an average fully equipped per-hull cost of about \$500M. Collectively, SSK’s represent about a quarter of the total submarine acquisition expenditure for all new European submarines tracked by AMI.

Nuclear-powered submarines (SSN and SSBN) make up the other 75% of the projected acquisition cost in European programs. Per-hull costs are highest for the larger strategic deterrence submarines being acquired by the U.K. and France, not surprising giving that these hulls are significantly larger (est. at 17,000 tonnes and 14,000 tonnes respectively) than SSNs, and 7-8 times the size of most European SSK designs.

France and the UK are only two countries in Europe that are acquiring nuclear-powered

Country	Number	Type	Status
France	6	ssn	Building
	3	ssbn	Planned
Germany	2	ssk	Planned
Italy	4	ssk	Building
Netherlands	4	ssk	Planned
Norway	4	ssk	Firm
Poland	3	ssk	Planned
Romania	2	ssk	Planned
Sweden	4	ssk	Building
Spain	4	ssk	Building
Turkey	6	ssk	Building
	4	ssbn	Building
UK	7	ssn	Building
Total	53		

Type	Number to be built through 2040	% of total number	Estimated total acquisition cost (USD Bn)	% of total acquisition cost
SSK	33	62%	16.96	26%
SSN	13	25%	19.56	30%
SSBN	7	13%	29.4	45%
	53		65.92	

attack submarines – in both cases as replacements for existing SSNs now in service. Neither France nor the UK continue to operate conventionally powered submarines, although France’s widely-exported SCOR-

chosen tkms as a strategic partner to the Norwegian Navy. As a result of this partnering, the Type 212CD (Common Design) was selected over the Naval Group SCOR-PENE as the preferred design. The first unit



Photo: tkms

**As part of a broader German-Norwegian project, the German Navy will procure two further Type 212 submarines.**

PENE SSK design is the basis for the Spanish S80 class.

### Current European Submarine Programmes

AMI tracks 11 submarine programs in nine European countries that are now in construction or planned over the next decade. A brief description of each of these programs follows.

**Germany:** In May 2017, the German Navy announced that it had intended on procuring two additional Type 212 submarines (hulls 7 and 8) due to the security situation in Europe. The submarines are part of a package deal with the Royal Norwegian Navy (RNoN), which will procure four units of the Type 212CD. All six units will be built at ThyssenKrupp Marine Systems (tkms) – Howaldtswerke Deutsche Werft AG (HDW).

**Norway:** In March 2017, the Norwegian Defence Ministry announced that they had

of a projected four hulls is expected to begin construction in 2020 and will commission in 2025.

**Italy:** In June 2017, it was announced that an additional four units of the U-212A (Batch III) would be ordered. Information indicates that the new submarines will be a modified U212 design fitted with an upgraded AIP system, allowing for around 20% more endurance. The four new SSKs will likely commission between 2026 and 2030.

**The Netherlands:** The RNIN is currently planning to replace the Walrus class under the WALRUS Replacement Programme (WRES). By September 2016 the programme (four hulls) was officially started at the Defence Materiel Organisation (DMO). Design selection is expected in 2019, followed by the Request for Proposals (RfP) in 2020 and the construction contract in 2021. The remaining competitors to supply the new submarine are assessed as Damen (teamed with Saab) and France’s Naval Group.

**Poland:** Design selection for three new submarines is still pending, with Swedish, French and German designs under consideration. If a preferred design is chosen by 2022, a construction contract could be in place by 2024, with the first unit entering service in 2029.

**Spain:** The construction of the first batch of four units (Batch I) of the S80A class was approved in late 2003, and construction began in Navantia’s shipyard in Cartagena in March 2005. By 2012 the S80 programme was delayed due to economic issues, with the first unit to be delivered in 2015 (rather than the original date of 2011). In late 2013, the programme faced further setbacks when the Spanish Navy announced that the first unit had stability issues resulting from 70 tonnes of excess weight. Questions also arose about the submarines’ Air Independent Propulsion (AIP) system. As of 2018, the first unit’s commissioning date is now 2022, the second in 2024, the third in 2025 and the fourth in 2027. Delays in the programme are expected to see modernisation and upkeep investments in Spain’s three GALERNA class submarines commissioned in the mid-1980s.

**Sweden:** In 2010, the Swedish Parliament approved the A26 Submarine (Nästa Generation Ubåt, or NGU) programme. The RSwN finalised its A26 design in 2014 with the government approving the programme in March 2015 and the construction contract for the first two units signed in June 2015. The first unit (Blekinge) is expected to enter service by 2024 and the second (Skane) in 2025. A minimum of 2 additional units to replace the three GOTLAND class are expected to be funded in the later years of the 2020s.

**Turkey:** In July 2008, ThyssenKrupp Marine (tkms) was selected as the preferred supplier for the programme to jointly build and supply six PIRI REIS class (Type 214) submarines. Golcuk Naval Shipyard near Istanbul is the shipyard performing integration and completion for the programme. Propulsion and combat system components are provided by companies that have supported previous Turkish submarine construction programmes: MTU, Siemens, Atlas Elektronik, Hensoldt, and Thales Aerospace. First steel was cut on unit one, TCG Piri Reis, in October 2015. The sixth unit in the programme is expected to be commissioned in 2026. Turkey is in the early stages of formalising an indigenous submarine design and construction programme, identified as the Milli Denizalti National Submarine (MIL-DEN). This new submarine programme is intended to replace the eight units of the

# Masthead

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PREVEZE (Type 209/1400) class that entered service from 1994 through 2008. While the specifics of the program are uncertain, a design phase involving Golcuk shipyard could begin in 2023 and run through 2025. In order for the submarine to begin replacing the Preveze class (the first of which reaches 35 years of service life in 2029), a construction contract with Golcuk would have to be in place no later than 2027 for the first submarine to enter service in 2033.

### France:

• **BARRACUDA Class Nuclear-Powered Attack Submarine (SSN):** In 2006 a US\$1.3Bn contract was awarded to France's Naval Group for the construction of the first unit of the class. Construction began at Naval Group's Cherbourg Shipyard in 2007 and the first unit was expected to commission into the French Navy in December 2017, later postpones to 2020. Units two and three were financed through 2012, and unit four in 2014. Unit five was funded in 2016 and ordered in 2018. Unit six will likely receive funding and be ordered in 2020. With the first unit now expected to enter service in 2020, units two through six are forecast to enter service from 2021 through 2029.

• **3G (Third Generation) Nuclear-Powered Ballistic Missile Submarine (SSBN):** 2011 marked the initial funding for the 3G SSBN to replace the four LE TRIUMPHANT class SSBNs, commissioned between 1989-and 2002. France is expected to replace the LE TRIUMPHANT class with platforms of like capability and numbers. The requirement to maintain the nuclear submarine construction industry will also drive timing of the new SSBN programme, as follow-on nuclear submarine work will be needed when the last BARRACUDA class SSN (De Grasse) is launched from Naval Group's Cherbourg Shipyard in 2023. If the French Navy begins construction of the first 3G SSBN in 2020, this will enable the new hull to replace LE TRIUMPHANT in 2027, its 40th anniversary. The new class is expected to commission at a rate of one every four years through 2039.

### United Kingdom:

• **ASTUTE Class Nuclear Powered Attack Submarine (SSN):** Concept development for this programme started in 1991, with the initial construction contract to build three hulls awarded to BAE shipbuilding in 1994. The SDSR 2010 process resulted in the decision to procure the seventh optional hull. SDSR 2015, released in November 2015, confirmed that all seven units of the class would be completed and enter service. The UK Treasury approved funding for the final hull in the class in March 2018. All seven units of the class are being built at Barrow, and hull seven is expected to be delivered to the RN in 2024.

• **DREADNOUGHT Class Nuclear Powered Ballistic Missile Submarine (SSBN):** The replacement of the VANGUARD class SSBN has been a subject of sharp debate within the UK and MoD. The 2015 SDSR stated that the SUCCESSOR SSBN Programme will replace the four units of the VANGUARD class. The major question that remained until the release of the SDSR was if the RN would maintain a continuous-at-sea deterrence (CASD) with four new units or with a near CASD with only three hulls. SDSR 2015 clarified that the CASD requirement was four new SSBNs replacing VANGUARD on a one-for-one basis. By October 2016, the MoD announced that the first of the four planned boats would be named HMS DREADNOUGHT. The first of the class is forecast for delivery in 2028, with the fourth hull expected to be commissioned in 2033. ■



# Reconnaissance at Sea

Jack Richardson

Given current tensions in the Gulf, including threats to shipping and deteriorating relations between the US and Iran, in addition to growing Russian and Chinese assertiveness at sea, reconnaissance in this domain has rarely been of greater importance. Warships have a wide array of sensors at their disposal from radar and sonar to Electro Optical Infra-Red (EO/IR) turrets and towed array sonar. However, a key part of maritime situational awareness is land-based Maritime Patrol Aircraft (MPA).

Since the early 1960s the majority of Western countries have used the Lockheed P3 ORION in this role. Derived from the ELECTRA airliner, this four-engine turboprop type has a crew of 13 to conduct its primary roles of Anti-Submarine Warfare (ASW), Anti-Surface Warfare, Search and Rescue (SAR) and Intelligence Surveillance and Reconnaissance (ISR). In the US though, the P3 is on the brink of being replaced by the P8 POSEIDON. Derived from the Boeing 737 NG airliner series, this was the winning design selected by the US Navy in 2004, entering into service in 2013. The P8 has a crew of two pilots and five or six mission systems operators who work at interchangeable consoles. Data taken from the aircraft's sensors can be fused to create a common situational picture. Unlike the P3, the P8 is optimised to conduct its mission from high altitude, as shown by the High-Altitude Anti-Submarine Weapon Capability wing system fitted to the Mk54 torpedo. Instead of a traditional Magnetic Anomaly Detector (MAD) in the rear fuselage to detect the alterations in the earth's magnetic field caused by submarines, experiments have been carried out to do this through a MAD fitted to a UAV launched from a sonobuoy dispenser. The type also features a powerful APY 10 surface search radar (with several search modes including for periscopes), a retractable EO/IR pod, with capacity for 120 sonobuoys, four underwing hard-points for Anti-Ship Missiles and five in the stern weapons bay for torpedoes. With 117 aircraft on order for the US Navy, the first export customer was the Indian Navy with eight (later rising to 12)

modified P8I aircraft (featuring a traditional MAD and 360-degree radar). This was followed by the Royal Australian Air Force ordering 12 aircraft (rising to fifteen). Another notable customer has been the UK's Royal Air Force with nine on order (designated

One is the fly-by-light control system, which instead of the fly-by-wire found on most modern aircraft, uses fibre-optics to transmit commands from the cockpit. Reportedly, this not only increases response time, but grants the aircraft protection against

Photo: Wikipedia



**The Kawasaki P-1 is a Japanese maritime patrol aircraft in service with the Japanese Navy as a replacement for the P-3C ORION.**

MRA1) to replace the cancelled NIMROD MRA4. The P8 has also been ordered by Norway, South Korea and New Zealand with further exports likely.

## Japan

A that has taken another approach however is Japan. Having built a large number of P3s under licence during the Cold War, Japan has successfully produced an indigenous MPA. The Kawasaki P1 uses four turbofan engines and a crew of 11 to 13 personnel to conduct patrols around Japan's extensive Exclusive Economic Zone (EEZ). In addition to a far higher payload than the POSEIDON, with eight under wing hard points, the aircraft has an array of innovative features.

electronic attack. Additionally, to assist the Tactical Co-ordinator (TACCO) in his mission, the aircraft uses sophisticated artificial intelligence software. The purpose of this is to give the crew a more effective method of tracking submarines and advising them to act accordingly. Japan's post-war pacifist constitution has traditionally prevented it from exporting military hardware. However, in his second stint as Prime Minister, having been in office since 2012, Shinzo Abe has tried to change this. The P1 has been deployed to the Arabian Sea on anti-piracy patrols as part of offers for several high-profile export contracts. These have included the UK and New Zealand's requirements to replace their NIMROD and P3 MPA fleet respectively. Although the P1 lost in both

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Photo: Aeroprints



**A Dassault FALCON of the French Navy**

cases to the P8 POSEIDON, Japan continues to market the type extensively. In the current MPA market, the P1 is unusual in that it was designed from scratch for this role (another example being the ATLANTIQUE, which France has operated since the 1970s and upgraded to serve into the 2030s). For those states that have more modest budgets though, there are

several examples of aircraft that have been converted from other roles to provide reconnaissance at sea. A prominent example is the maritime variant of the C295 produced by Airbus Defence and Space. This twin turboprop type has a wide variety of configurations. At the more capable end of the scale, is the C295 MPA PERSUADER model operated by the Chilean Navy. These aircraft have a mission crew of four who operate the Fully Integrated Tac-

SUPER HERCULES with scalable capabilities in this area, either in permanent fit or roll-on roll-off (RoRo) configuration.

### Converted Business Jets

Another increasingly popular option for providing reconnaissance at sea is through converting business jets. A type that has been proposed by on several occasions for conversion to MPA status is Bombardier's GLOBAL series of ultra-long-range business jets. The Elta Systems of Israel and Saab of Sweden have proposed fitting the 5000 and 6000 models respectively as MPAs (the latter termed SWORDFISH). Though these proposals, and another from Embraer of Brazil based on its EMB 145 jet have not yet been ordered, other solutions based on business jets have come to fruition. For example, the French Marine Nationale operates a number of FALCON business jets to provide maritime surveillance in the France's extensive EEZ. Other examples include the United Arab Emirates who use Bombardier's Q400 turbo-prop airliner as an MPA and the ATR 42 in service with the Italian, Turkish and Pakistani navies. The UAE has also ordered the 'Global-Eye' ISR system. This is a Global 6000 fitted with Saab's ERIEYE air-to-air radar and an AESA radar on the lower fuselage for surface reconnaissance. The result is an aircraft with three-dimensional radar coverage (in addition to an EO/IR turret). Thus, a single airframe can carry out land, sea and air reconnaissance. In addition to their core role of Command and Control for Air Forces, larger Airborne Warning and Control System aircraft such as the E3 SENTRY, A50 MAINSTAY and Boeing 737 based solutions such as the E7A WEDGETAIL have a limited capability to provide maritime reconnaissance. Another aircraft that was built for AEW and since diversified is the E2 HAWK-EYE. This is in its latest E2D 'Advanced' model, where in addition to features such as air-to-air refuelling, a glass cockpit and more efficient propulsion, it is able to act as a forward sensor for combat assets. Thus, it is able to detect potential targets (land, sea and air) and designate them for over-the-horizon strike with modern weapons such as the SM-6 missile. Additionally, the US Navy's carrier borne aircraft, currently the Boeing F/A18E/F SUPER HORNET but soon to be complemented by the Lockheed Martin F35C LIGHTNING II, are highly capable reconnaissance assets in the maritime domain. The US Navy is, however, taking steps to enhance their range through the procurement of the MQ-25 STINGRAY UAV. The role of this aircraft is to enable these fighter aircraft to operate at longer

Photo: US Navy



**In the US the P8 POSEIDON replaced the P3 ORION. The POSEIDON is derived from the Boeing 737 NG airliner.**

tical System from identical consoles in the main cabin to control the aircraft's extensive sensor suite, which can include, depending on the requirement, a radar, EO/IR sensor beneath the nose, a MAD and other Electronic Support Measures and sonobuoys. The aircraft is able to drop torpedoes to prosecute sub-surface threats and a rear-ramp from which SAR equipment can be

deployed. This also enables the ASW equipment to be removed so a wider array of roles can be accomplished. The Royal Air Force of Oman, for example, operates eight C295's, five in the general transport role and three as MPAs. This configuration lacks a sonobuoy dispenser as the aircraft is used towards the lower end of the operational spectrum. Several types of transport aircraft can be modified in this manner. For example, Lockheed Martin has offered the C130J

ranges for greater periods of time through air-to-air refuelling. Boeing was announced as the winner of a contract to produce four examples to enter service in 2024, with a long-term plan for 72. Although this programme is less ambitious than previous efforts to field UAVs on US Navy carriers, the option remains for the type to carry out ISR roles in the future. Having never fielded equivalent vessels during the Cold War, the former Soviet Union sought to counter US aircraft carriers and their air wings using land-based aircraft. A notable example still used today is the Tupolev 95 BEAR. Having first entered service in 1956 as a nuclear strategic bomber, it was adapted by the Soviet Union to shadow US carrier battle-groups and remains capable of patrolling the maritime domain today. The former Soviet Union also supplied several aligned countries with the Tupolev 142 long range MPA, derived from the BEAR. Whilst Russia continues to use this aircraft today, it was recently decommissioned by India. The latter does, however, still operate the Il 38 in upgraded 'SEA DRAGON' configuration with modern ESM and other sensors fitted in addition to a wide-array of weaponry for use in the maritime environment from its five strong fleet. Elsewhere in this volatile

Photo: Wikipedia



**A Chilean Navy C-295 PERSUADER in primer during a trials flight**

region, China's People's Liberation Army Navy (PLAN) deploys the Xian H6K, a derivative of the Tupolev 16 BADGER, an early Cold War Soviet strategic bomber that has now been retrofitted with stand-off, supersonic capable cruise missiles. This is a key part of China's strategy of dominating its near abroad by possessing assets capable of targeting US carrier battlegroups.

**Unmanned Aerial Vehicles**

Due to the nature of long-range reconnaissance at sea, UAVs are becoming a

more popular method of providing this key coverage. These range from small quadcopters, similar to those available on the commercial market that ship crews can use to inspect hard to reach parts of their vessels, to large fixed-wing types. Standing out in the latter category is the Northrup Grumman MQ-4 TRITON. Derived from the GLOBAL HAWK UAV, this large aircraft is equipped with an EO/IR sensor and maritime radar. With a ground crew of four, this aircraft is able to monitor large areas of ocean continuously. The US Navy, its primary operator, plans to deploy

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Photo: US Navy



**A Canadian CH-124 SEA KING performs deck landing qualification flights on board the dock landing ship USS PEARL HARBOR**

the aircraft from key bases around the globe to complement the P8 POSEIDON's ASW capabilities. The Royal Australian Air Force has also purchased the TRITON to monitor the countries maritime approaches (also in concert with the P8). As this trend intensifies, an increasing number of existing UAV designs are being adapted for maritime applications. In the Medium Altitude Long Endurance (MALE) class, the MQ-9 REAPER has been adapted as the 'Certified PREDATOR B' and ordered by the UK as 'PROTECTOR.' Although its primary role is overland ISR and attack by using the BRIMSTONE missile and PAVEWAY IV bomb, this aircraft could also be used for reconnaissance at sea. It has an inbuilt Lynx radar with SAR, maritime and littoral search modes. There is also the option to equip it with modular payloads such as Raytheon's SEAVUE radar or miniature sonobuoys made by Ultra-Electronics. The

UK has current experience of UAVs being used for littoral reconnaissance by virtue of the Army's WATCHKEEPER UAV carrying out this function during exercises. This platform is based on the Hermes 450 and its manufacturer, Elbit Systems, also offers the Hermes 900, equipped with an MPA radar. For UAV operations at sea, Boeing subsidiary Insitu has manufactured the ScanEagle. Powered by a push propeller, this aircraft is launched from a rail mounted catapult and recovered using wire strung across a frame mounted from a ship's flight deck. Core roles for this UAV include on-demand ISR and battle damage assessment for military, maritime security and civil applications.

### Helicopters

At present though, a more common solution for aerial reconnaissance assets at

sea remains helicopters. There are several types on the market today, one of the most numerous being the Sikorsky SEA-HAWK series. The latest iteration of this is the MH-60 ROMEO model, produced in partnership with Sikorsky owner Lockheed Martin. This aircraft is equipped to counter the modern threats of ultra-quiet submarines (with a sonobuoy dispenser and dipping sonar) and 'swarming' Fast Inshore Attack Craft (FIACs). For the latter, it has a belly mounted 360-degree AESA radar and nose mounted EO/IR in addition to hard-points, which can carry laser-guided HELLFIRE missiles. These can be combined with the Mk54 torpedo for the ASW role. This aircraft has a crew of three (pilot, TACCO and sensor operator) and is key to providing ASW coverage to US carrier strike groups (flying from both the carriers and their escorts). It has also enjoyed export success to Denmark (currently without the ASW equipment), Australia and Saudi Arabia. India, Greece and Mexico have also ordered this type. In direct competition with the MH-60R is the frigate variant of the NH-90. Though being the first helicopter to have a fly-by-wire control system, it had a troubled development with various delays entering service. However, it now has a large number of operators across the world, including the Dutch Navy, which deploys the type across its escort fleet. The aircraft also has a pilot, TACCO and sensor operator, with the option for a second of the latter.

A third aircraft in this category is the Leonardo 101, used by the Italian Navy and Royal Navy (the latter of which terms it the 'MERLIN'). In addition to the core ASW role (Italy uses it for surface attack by virtue of the Marte anti-ship missile), both services have selected it for Airborne Early Warning. In the case of the UK, 10 examples of the CROWSNEST system, incorporating the Thales Searchwater radar and Lockheed Martin CERBERUS control system, will be procured to be fitted throughout the MERLIN fleet on a RoRo basis. The purpose of this is to provide Airborne Early Warning (AEW) and general reconnaissance coverage to the new QUEEN ELIZABETH class aircraft carriers. It is planned for each vessel to deploy with nine ASW MERLINS and four fitted for AEW. This versatile aircraft has also been ordered by the Algerian and Polish navies. In addition, the UK has built and exported another helicopter in this role. The Leonardo AW159 WILDCAT is an advanced derivative of the Westland Lynx (which Algeria also operates as the older SUPER LYNX 300) built for the UK Armed Forces during the 1970s. This new and improved model features a built-in EO/IR on the nose, 360-degree AESA radar, a tail



Photo: US Airforce

**A C-130J SUPER HERCULES taxis down the runway at Lockheed Martin Aeronautics Company, Marietta, Ga., in February 2017, before taking off for Japan. The aircraft was bound for Yokota Air Base, Japan, and was the first of Yokota's C-130J projected deliveries.**

stabiliser and engines better suited to hot environments. The type has been exported to Bangladesh, the Philippines and South Korea, the latter two of which have a dipping sonar fitted to their aircraft. It is also compatible with a wide array of weapons. This includes the MARTLET and SEA VENOM missiles for the UK (light and heavy respectively) and the SPIKE NLOS (missile) and BLUE SHARK torpedo for South Korea. Notably, MARTLET can be used to counter FIAC swarms and potentially UAVs.

In its long running effort to replace the ASW SEA KING, Canada opted to adapt a civilian design from the Sikorsky 92, leading to the CH 148 CYCLONE which, after many years delay, is providing maritime reconnaissance capabilities from Canada's HALIFAX class frigates. Separately from Western types, the former Soviet Union also produced the KAMOV range of helicopters with the NATO codename HELIX. These are particularly notable for their coaxial rotor arrangement (one mounted atop the other). Developed as a successor to the KAMOV 25 (codenamed 'HORMONE' by NATO), the KAMOV 27 can be operated from both large and small ships, including the Russian Navy's only aircraft carrier, the ADMIRAL KUZNETSOV. The type, which can carry either a single homing torpedo or torpedo underwa-



Photo: US Navy

**The CH-148 CYCLONE helicopter is providing maritime reconnaissance capabilities from Canada's HALIFAX class frigates.**

ter rocket, has been exported to other navies, including those of China and India. The latter has also purchased the KAMOV 31, a model that is equipped with a fuselage mounted radar to provide AEW coverage. India deploys this type, as a crew of two, on its aircraft carrier INS VIKRAMADITYA and TALWAR class frigates.

Despite their versatility, in times of limited defence budgets, capable helicopters to provide effective reconnaissance at sea are expensive. Thus, many navies around the world are investing in UAVs to fulfil this key role. A notable example is the MQ-8B FIRE-SCOUT. Produced by Northrup Grumman for the US Navy, this UAV has the role of

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**The PROTECTOR USV is an unmanned integrated naval combat system, based on a rigid hull inflatable boat. It has a complete sensor, navigation and weapon suite and can be remotely controlled from shore or from ships at sea.**



**Israel's Elbit Systems has developed the SEAGULL USV. In addition to Mine Countermeasures, the USV can be used for anti-submarine warfare.**

providing situational awareness to all types of surface vessel. In particular, it is an integral part of the surface mission package of the modular littoral combat ship. This concept involves the MQ-8B being embarked on one of these controversial ships with an MH-60R and the MQ-8B being used to provide over-the-horizon ISR. Specifically, this can be to detect FIAC swarms and either direct the MH-60R to counter them or do this itself, by virtue of the Advanced Precision Weapon Kill System it carries. The US Navy is currently in the process of procuring the MQ-8C model, which is larger and more capable because it is derived from the Bell 407 commercial helicopter. Other players in this industry are providing rotary wing UAVs. Examples include Austria's Schiebel CAM-COPTER S100, the UMS SKELDAR V200 (jointly produced by Switzerland and Sweden), Airbus Helicopters' VSR700 and the HERO, made by Leonardo. All of these have the ability to fit different payload modules into onboard mission pays to suite differ-

ent scenarios. With endurance of six hours (up to 10 in the case of the S100) these are very useful for reconnaissance at sea, as has been demonstrated with the S100 patrolling the Mediterranean for boats carrying illegal migrants.

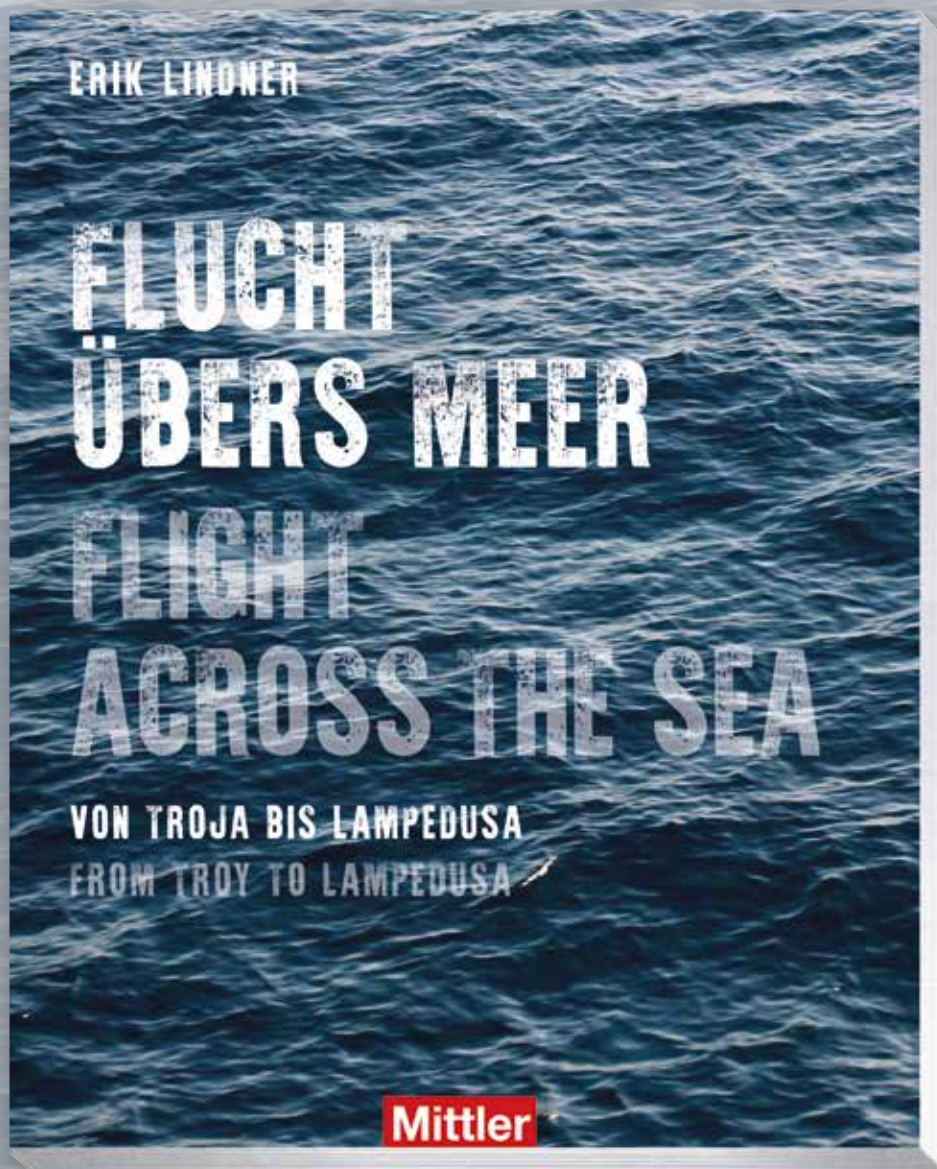
### Unmanned Surface Vehicles

As unconventional tasks such as migrant interdiction become more important, other novel maritime reconnaissance methods are being devised. A key example of this trend is in building Unmanned Surface Vehicles (USVs). Recently, BAE Systems trialed a Pacific 950 Rigid Inflatable Boat with software to enable autonomous operations for up to hours and featuring the option for a machine gun (under human control) to conduct persistent surveillance missions. On a larger scale, the US Defence Advanced Research Projects Agency has since 2016 been developing the SEA HUNTER USV. At a cost of US\$2M each, these would allow the opera-

tor to deploy large numbers of these vessels for long periods in order to track sub-surface targets. Unlike this unarmed concept though, companies in Israel are developing weaponised USVs. One is the PROTECTOR from Rafael Defence Systems. With deliveries to the Republic of Singapore Navy in 2004, PROTECTOR is available in 9 to 11 metre configurations and features a 360 EO/IR camera for situational awareness. As part of carrying out its core maritime security role, various calibres of machine gun can be fitted, alternatively, it can deploy a 40mm grenade launcher, the SPIKE NLOS missile or non-lethal water cannon. Israel's Elbit Systems has gone further by developing the SEAGULL USV. In addition to Mine Countermeasures, this USV is shown equipped with a dipping sonar to detect submarines and a torpedo system for prosecuting them.

### Unmanned Underwater Vehicles

As important as reconnaissance on the surface is that beneath the surface, something increasingly being done by Unmanned Underwater Vehicles (UUVs). Originally used by the US Navy to clear mines prior to the 2003 invasion of Iraq, the REMUS UUV from Hydroid systems is now available to provide maritime reconnaissance. With three models able to reach 100, 600 and 6000 metres respectively, it can be fitted with a wide variety of modular sensors, including the possibility of launching small UAVs. The manufacturer is also trying an automated launch and recovery capability to enable the vehicle to be deployed and recovered from all maritime environments. Another type of UUV is the ORCA Extra Large UUV produced by Boeing. Derived from the ECHO VOYAGER prototype developed by the company, this 15m, diesel-electric vessel is intended to be deployed from shore and provide improved situational awareness in both the deep ocean and near-shore. Envisaged roles include ASW, MCM and ISR. The rationale for this system, for which Boeing has been contracted to build five for \$274.6M, is to free up the US Navy's high value hunter-killer submarines for roles such as protecting their ballistic missile carrying counterparts. In April 2019, the UK MoD announced a competition to develop a demonstrator in order to inform on a similar capability. As the maritime domain becomes more complicated with the need for timely and accurate reconnaissance increasing, it is clear that existing solutions are being developed, alongside news ones, to give international militaries the resources they need at an affordable price. ■



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# A New Era for ASuW/ASW Airborne Platforms?

Luca Peruzzi

The increasing number of countries procuring or interested in submarines programmes have pushed NATO's and worldwide main navies and air forces to look for upgrading or procuring new ASuW/ASW platforms, commonly classified as Maritime Patrol Aircraft.

The increasing underwater threat in main seas basins – from the North Atlantic to Pacific Ocean passing through Mediterranean Sea and Indian Ocean – requires long-range Maritime Patrol Aircrafts (MPAs) capable of accomplishing a range of missions

## The Heavier ASuW/ASW Platforms

Developed to replace the well-operated though aging P-3 aircraft and having achieved initial operational capability with

operate both at high and low altitudes with a load factor of +2.2g/-0.5 g and a 165-metres sustained turn radius of circa 990 metres. With a crew of nine, including two pilots, the internal layout sees a resting area, electronics cabinets, mission management area, rear electronics cabinet and sonobuoy stowage and launching areas. The P-8A is equipped with a rear underbelly weapon bay with five hardpoints for weapon systems, including torpedoes, mines and Search & Rescue (SAR) Kit, four underwing and two fuselage-mounted hardpoint for HARPOON anti-ship missiles and other payloads such as long-range side-looking radars.

The mission suite is centred on the tactical managing system with five consoles equipped with dual, ultra-high-resolution 24 inch displays and a communications package, including plain/secure V/UHF, UHF radios, military and INMARSAT SATCOM, datalink Link 11/16, tactical data links, and secure connectivity. The sensors package features the Raytheon AN/APY-10 multimode radar with ISAR/SAR modes and IFF interrogation, Wescam MX-20HD EO/IR turret and Lockheed Martin ALQ-240 ESM together with weapon and stores management system, and self-protection with the AN/AAR-54 missile warning system (MWS), AN/AAQ-24(V) LAIRCM and ALE-47 counter-measures dispensing system (CMDS). The ASW suite is based on AN/AAQ-2(V)1 acoustic system capable of receiving, processing and recording 64 channels of passive and active data, including sonobuoy positioning and a multi-static active coherent (MAC) system. The latter is designed to provide an enhanced wide-area acoustic search capability by processing multiple returns from a field of active and passive GPS-embedded sonobuoys, of which the P-8A carries 126 different types. Initial MAC capability (Phase I) was introduced on board the P-8A in 2015 while Phase II is expected in 2024.



Photo: Australian DoD

**The Boeing P-8A Multi-mission Maritime Aircraft has earned worldwide export success, having been procured by Australia, India, Norway, New Zealand, South Korea and the UK.**

from ASW to intelligence collection to satisfy operational requirements and to justify the higher procurement and life-cycle costs. More recently, due to technological evolution and miniaturisation, the highly-capable ASW airborne systems are allowing the new class of long-range business jets to become an alternative and lower-cost solution compared to larger platforms. Their effectiveness and flexibility still needs to be proven on the field. The following overview of available ASuW/ASW platforms and those under development also include the less-capable turboprop-equipped MPAs, which also represent a cost-effective solution.

the US Navy in November 2013, the Boeing P-8A POSEIDON or Multi-mission Maritime Aircraft (MMA) has found worldwide export success, having been procured by Australia, India, Norway, New Zealand, South Korea and UK. Based on the Boeing 737-800 with 737-900 wings, the P-8A POSEIDON is a purpose-built military aircraft with a maximum take-off weight of 85.8 tonnes, a 4,000 nm self-deployment capability extendable with air-refuelling, and a mission radius of 1,200 nm with a four-hour on station time. With an average transit speed of 340 knots and a maximum airspeed of 400 knots, the P-8A can





Photo: Australian DoD

**Both the US Navy and Royal Australian Air Force are integrating the P-8A POSEIDON with Northrop Grumman MQ-4C TRITON operations.**

The Indian Navy's P-8I differs mainly due to the addition of CAE AN/ASQ-508A Magnetic Anomaly Detection (MAD) system, an extra rear-facing APS-143C(V)3 surveillance radar to ensure 360 degrees coverage and Indian companies' data link, SATCOM and secure communications. The US Navy plans to incrementally improve baseline P-8A capabilities by integrating the Advanced Airborne Sensor (AAS) represented by Raytheon APS-154 radar, AGM-84 HARPOON Block II+, and High Altitude ASW Weapon Capability (HAAWC) MK 54 torpedo to allow high-altitude operations with platform sensors improvements, in addition to ASW signals intelligence sensors, and avionics architecture improvements. With the P-8A Increment Three Programme, the US Navy will introduce significant war-altering ASW enhancements through combat system hardware, architecture, ASW/ASuW sensors improvements, communication capability upgrades, ASuW Net Enabled Weapon (NEW) and 'Higher-Than-Secret' (HTS) security capabilities.

Specifically developed by the Japanese aerospace and defence industry as a dedicated ASW MPA platform to replace the P-3C within the Japan Maritime Self-Defence Force (JMSDF), the Kawasaki Heavy Industries P-1 MPA platform has been attracting a lot of interest and been presented worldwide to potential customers in Europe, Asia and the Pacific. Combining performance at both high-altitude/high-speed and low-altitude/low-speed due to a large wing area and high limit load factor, together with a four-engines configuration based on new Ishikawajima-Harima Heavy Industries F7-10 high-bypass ratio two-spool turbofans (achieving high-reduction in fuel consumption and noise), the P-1 has a basic take-off weight of 79.7 tonnes. With a cruise speed of 450 knots and a cruise altitude of 11,880 metres, the range stands at 8,000 km, which allows for a 1,320 nm operating

radius with four-hour on-station (higher than P-3C and P-8 counterparts), operating from JMSDF air bases, as the platform does not possess in-flight refuelling capabilities. Equipped with the first operational fly-by-light flight control system, as well as a large windshield compared to commercial platforms and bubble windows for superior visibility, the P-1 features a large fuselage cross-section with a wide front-underbelly area with eight hardpoints for torpedoes and other weapon systems in addition to the same number of underwing hardpoints (each capable of 1000 kg) for a total payload of circa nine tonnes, including ASM-C1 and HARPOON anti-ship and AGM-65 MAVERICK air-to-surface missiles. With a 13-crew complement, the flight deck accommodates two pilots, one flight engineer and one observer and a glass cockpit with multi-function displays and HUDs.

The Toshiba HYQ-3 Advanced Combat Direction System (ACDS) is managed by six operators – including four dedicated sensor stations as well as tactical co-ordinator and navigation/communication operator consoles. Featuring artificial intelligent-applied technology, the ACDS controls a communications suite with UHF/VHF and SATCOM and tactical data with Link 16 and a sensors package – including Toshiba HPS-106 AESA radar with four antennas featuring Gallium Nitride technology with periscope detection from high altitude and SAR/ISAR functions, HPX-105 IFF, Fujitsu HAQ-2 HD EO/IR turret, Mitsubishi HLR-109B ESM with improved low-frequency monitoring capabilities and self-protection with RWR, MWS and chaff/flare dispensers, in addition to HSQ-102 MAD based on the CAE AN/ASQ-508(V) system. With shallow-water operating capabilities, the ASW suite is centred on the Nippon Electric Company's HQA-7 high-gain acoustic processor and HRQ-1 acoustic receiver, with a 100 sonobuoys available inventory.

With France and Germany having agreed to jointly develop a successor to their maritime patrol capabilities in addition to a lively international market, Airbus is working on the configuration of an eventual future A320 MPA, based on 'state-of-the-art' technologies, launching the Research and Development and Research and Technology funded programmes. The launch of a demonstrator is currently being analysed, based on the timeframe of future procurement programmes for target customers. Based on the A320neo M3A (Modular Multi-Mission Aircraft) concept – unveiled in July 2018 – and conceived to accom-



Photo: Japanese MoD

**The KHI P-1 combines performance at both high-altitude/high-speed and low-altitude/low-speed with four high-bypass-ratio four-engine configuration.**



Photo: Airbus

**Airbus claims the A320neo MPA design is well suited for low-altitude loiter and search, offering all-round agility and performance.**

plish different missions with the benefit of growth capabilities in a large cross-section fuselage, long range and endurance, as well as low operational and life-cycle costs with a worldwide supply chain and training network, Airbus claims the A320neo MPA design is well suited for low-altitude loiter and search, therefore, offering all-round agility and performance. The maximum take-off and landing weights

with a mission management area based on advanced operator consoles, observer stations, sonobuoy launcher, stowage rear section in addition to a rest area with toilet and galley.

The mission package is centred on a new-generation C2 suite based on FITS (Fully Integrated Tactical System) developments with network centric communications, including data links and SATCOMs, man-



Photo: Saab

**Based on the same Bombardier GLOBAL 6000 platform, the SWORDFISH MPA platform shares around 70% commonality, including mission systems with the already available GLOBALEYE AEW&C sisterships.**

of the base platform are 79 tonnes and 67.4 tonnes respectively with a maximum speed of 450 knots. Featuring a weapon bay capable of accommodating up to eight lightweight torpedoes, mines and other ASW weapons in the rear underbelly fuselage, and four underwing hardpoints for anti-ship missiles and guided-weapons, the A320 MPA internal layout has been designed for long-range operations,

aging a sensor package, involving an AESA SAR radar with IFF, high-definition EO/IR sensors together with an unspecified ESM/ELINT system in addition to self-protection, a MAD detector mounted in the rear fuselage, an ASW suite based on new-generation acoustic processor and sonobuoy management system. The latter can develop from the new systems being integrated on board the ATL2

through the modernisation programme managed by Dassault Aviation and Thales, including the SEARCHMASTER AESA radar benefiting from latest technologies based on Rafale combat aircraft programme, and the latest-generation digital acoustic processing subsystem (STAN) together with a new Wescam EO/IR suite, tactical picture elaborating software from Naval Group and SIAÉ's upgraded tactical display consoles as well as the new SonoFlash sonobuoy system developed by Thales for the French Navy.

## The Business-Jet Derived Solutions

Based on the experiences with the multi-role and swing-role GLOBALEYE AEW&C and previous ISR/AEW&C/MPA programmes, the Saab Group developed the SWORDFISH MPA solution. Based on the Bombardier Global 6000 platform already used for GLOBALEYE's sister ship and sharing around 70 per cent commonality, including mission management system, EW and self-protection systems, AESA radar, electro-optics, AIS and the majority of communication systems with the latter aircraft, Saab has refined SWORDFISH design following its launching at 2016 Singapore Air Show, receiving significant interest from potential international users. Taking advantage of the long-range biz-jet endurance and optimised low-level performances, the SWORDFISH MPA shares Bombardier's VISION flightdeck and introduces an internal layout centred on a mid-fuselage mission management station with crew rest/mission planning area, observe positions, galley and lavatory in the front, stowage and rotary and fixed sonobuoy launch areas in the back. Externally, the platform differs for oversize observer windows and four hardpoints under the wings capable of carrying respectively two (on the inner pylons) and one (on the external pylons) torpedoes as an alternative to anti-ship missiles and SKAD rescue pods.

The Saab-provided mission control suite is based on four-to-five multifunction and interoperable consoles with a 30-inch flat screen each, managing a sensor package, including Leonardo SEASPRAY 7500E AESA radar with ISAR/SAR modes and IFF, FLIR Systems Star SAFIRE-380HLD EO/IR payload, maritime AIS, secure V/UHF radios, SATCOM and tactical data links, Saab HES-21 integrated ESM and self-protection system with RWR, MAW and CDMS. The ASW suite is centred on General Dynamics Mission Systems Canada UYS-505 Venom acoustics suite processor with the sonobuoy receiving and location system, CAE MAD and a gravity-launching

system with an operational load capacity of 100 A- or 200G- or 300 F-sized or a types combination from Ultra Electronics UK. With a range of 5,200 nm and maximum cruise speed of 450 knot reduced to 360 for long-range cruise, the SWORDFISH has a service ceiling of 12,200 metres and reduced take-off and landing distances. The typical mission profile for maritime surveillance is 200 mn transit for a 11.5-hour time-on-station patrolling at 1,650 metres with IFR reserves, reduced at 7.3-hour at 1,000 nm, in both cases at ISA standard condition at sea level with a five+ crew, full sonobuoy-load and no external stores.

The Israel Aerospace Industry's ELTA systems subsidiary is offering its ELI-3360 G5000 MPA solution based on the Bombardier Global 5000 business jet platform already used for its family of ELW-2085 CAEW and ELI-350 MARS ISR platforms. Mastering the experience developed with the electronics package integration and modifications for these versions, IAI/ELTA has matched the Global 5000 capacities to operate at altitudes of 13,860 metres, fast climb performance, quick reaction time and fast deployment, long range/long endurance at over 6,000 nm. It has a spacious comfortable mission cabin with a mission suite centred on the ELS-8100 multi-mission tactical management system (TMS) with two-to-six mission operators with intuitive multi-role workstations and integrated open architecture, managing a communications suite with network centric datalinks and a sensor package, including ELM-2022 multi-mission radar with surveillance, imaging and tracking capacities integrated with an automatic identification



Photo: Saab

**The SWORDFISH MPA's mission control suite from Saab manages a sensor package, including AESA radar, HD EO/IR, AIS, communications with SATCOM data links, ESM/ELINT, self-protection and ASW suite.**

system (AIS) and IFF, ELL-8382 ESM/ELINT and CESM/COMINT/Scanning DF, AMOSP 3000HD multi-sensor EO/IR/Laser turret and ELL-2160V1 self-protection suite chaff/flares/RF-jammer.

The ASW is based on an unspecified acoustic sensor suite with sonobuoys launcher and dispenser system together with a weapons and stores management system for ASW and ASuW. The ELI-3360 G5000 MPA has four underwing hard-points capable of carrying torpedoes, anti-ship missiles as well as rescue and self-protection pods. The ELI-3360 G500 MPA has been proposed for different tenders or programmes worldwide, especially where IAI/ELTA has already provided the other platforms of the Bombardier's GLOBAL 5000 family offering communalities and service-life cost reductions.

## The Turboprop Solutions

The Leonardo aircraft division is offering its ATR72 MP/ASW platform solution which, in a customised ASW version with Thales mission suite, has been developed for the Turkish Ministry of Defence. Under the MELTEM III, Leonardo is expected to deliver six ATR-72-600's in the Turkish Maritime Patrol Aircraft (TMPA) configuration from 2019 while two aircrafts in a utility-configured version (Turkish Maritime Utility Aircraft) are already in service. Among the airframe tailored modifications, including MAD, the TMPA features four fuselage-mounted hardpoints capable of carrying up to 454 kg for lightweight torpedoes (LWT) or other payloads – including anti-ship missiles and mines, of which the front twin has been certified to carry and deliver Raytheon Mk46 Mode 5 and Mk54 LWTs for the Turkish Navy.

The Italian Air Force has been the launch customer for the ATR72MP, which was also procured by Italian Custom Service, both with a comprehensive although different mission suite. With a 23 tonnes maximum take-off weight, the ATR72MP is equipped with a Thales Avionics' glass cockpit and two Pratt & Whitney Canada PW127M engines, allowing for a maximum cruising speed of 250 knots and an 8,250 metres maximum operational altitude. Characterised by bubble windows and in-flight operable door, the Italian Air Force's ATR72MP has a basic eight crew complement with air force and navy personnel, including two pilots, four operators and two observers. While the mission suite is based on Leonardo's Airborne Tactical Observation and Surveillance (ATOS) system in a maritime long-range surveillance (MLRS) version with four consoles featuring a 24-inch-high-definition multifunctional colour display and programmable entry



Photo: Leonardo

**The Leonardo aircraft division is offering its ATR-72 MP/ASW platform solution which, in a customised ASW version, is to be delivered to the Turkish MoD. The ATR-72 MP solution is in service with Italian Air Force and has been procured by the Italian Customs Police.**

Photo: Airbus



**Airbus's C235 and C295 family has gained significant international success with its maritime surveillance and patrol versions.**

Photo: Airbus



**The C-295 MSA/MPA is in service or has been procured by Portuguese, Omani, Brazilian and Canadian Air Forces and the Chilean Navy in addition to the Saudi Arabian Homeland Security Command.**

panels, Leonardo has almost completed development of a lightweight and compact ASW suite and weapon store management. The Leonardo's communications suite features V/UHF and HF radios with INMARSAT and SICRAL SATCOM capabilities, datalink management unit for Link 11/16, crypto, new-generation IFF, AIS and ASARS DF for SAR and CSAR missions.

The sensor suite includes Leonardo's SEA SPRAY 7300E AESA radar and FLIR Systems STAR SAFIRE 380HD EO/IR turret, Elettronica's ELT-800(V)2 ESM/ELINT with full radar warning capabilities in addition to an expandable self-protection suite with Leonardo's RALM 01/V2 LWS, Hensoldt AN/AAR 60 (MILDS II) MWS and MES ECDS-2 CMDS. The ATR-72 in the ASW variant would maintain the fuselage-mounted hardpoints and MAD tail cone of the Turkish TMPA version and an enhanced Leonardo ATOS mission suite, including the ASW module, store management system for torpedoes, mines and anti-ship missiles and the acoustic system with sonobuoy stowage and launching system. Leonardo's new ULISSES (Ultra-Light SonicS Enhanced System) ASW suite is centred on the acoustic processor handling up

to 64 sonobuoys and the VHF receiver with sonobuoy localisation system, which is compatible with Ultra Electronics new-generation mini-sonobuoys. With a 200 nm transit to the search area, the on-station time for an ATR-72MP variant reaches 7.6-hour at 1,500 metres while an ASW mission conducted by the ATR-72ASW at the same distance could last almost six-hour.

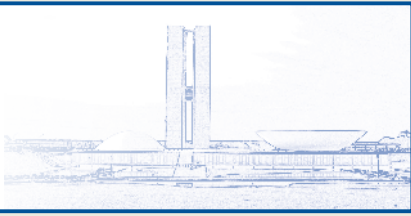
The family of Airbus's C235 and C295 in the maritime surveillance and patrol versions has found significant international success. The Turkish Navy operates a maritime patrol and antisubmarine version of the C-235 model under MELTEM II, with a Thales-provided mission and acoustic suite with MAD and underwings hardpoints for lightweight torpedoes. 208 units have been ordered by 28 countries, as of December 2018, of which 168 aircraft have been delivered and 166 are in operation, in addition to the main transport/armed version and proposed SIGINT and AEW&C, the C295 platform saw the development of the MSA (maritime surveillance aircraft) and MPA (Maritime Patrol Aircraft) versions coming with a comprehensive mission suite based on the Airbus FITS (Fully Integrated

Tactical System) that is equipping almost 100 aircrafts.

The C-295 MSA/MPA have been procured or is in service with the Portuguese, Oman, Brazilian and Canadian Air Forces and Chilean Navy in addition to Saudi Arabia Homeland Security Command, while the C-235 MSA users include the Irish Air Corp, Spanish agencies and Air Force, US Coast Guard, Colombian, Ecuador and Mexican Navies together with the Spanish and Brazilian Air Forces' P-3 MPAs. As a military conceived solution capable of conducting the most demanding MPA tasks with high manoeuvrability and low-level flight at low-speed capabilities, together with low-life-cycle and operating costs, the C-295 MPA version comes with underwings hardpoints for torpedoes and anti-ship missiles, as well as winglets and enhanced performance engines modes offering longer endurance and fuel savings in addition to better hot-and-high capabilities and sensors and MAD accommodations.

Equipped with Thales Topdeck avionics, the comprehensive mission suite comes with custom-selected package based on FITS, communications and sensors, including Thales or other supplier's AESA radar, HD EO/IR sensors, ESM/ELINT and optionally COMINT suites, MAD, self-protection and ASW suite centred on the acoustic processor, sonobuoy launchers and stowage. According to an Airbus released presentation, the C295 MPA with a complete ASuW/ASW suite based on four consoles-configured FITS, six operators and two torpedoes has an 8.5-hour on-station time at 200 mn.

The Canadian company's PAL Aerospace as prime contractor with Thales Group has converted and equipped two Bombardier Dash 8 Q300 platforms with a comprehensive ASuW/ASW suite, which are in service with the United Arab Emirates Air Force. PAL's airframe conversion includes adding observation windows, in-flight operable side door, air-drop hatch in the lower rear fuselage and an extended-range fuel system. Leading the mission system integration, Thales has provided AMASCOS (Airborne Maritime Situation and Control System) tactical command system controlling a sensors suite, including Thales Ocean Master 400 radar, identification/communications systems and TMS 2000 acoustics processing from Thales, FLIR Systems' EO/IR turret, Elettronica's ESM/ELINT and self-protection together with sonobuoy launchers and stowage. Both Saab and IAI/ELTA have been offering the above-mentioned ASuEW/ASW mission package for turboprop aircrafts, increasing the opportunities for potential solutions on the market. ■



## Viewpoint from Brasilia



Photo: Author

# Living in the Expectation of Better Days

**Roberto G. Carvalho**

**B**ase Industrial de Defesa (BID) is the name of a Brazilian organisation that brings together state and private companies that participate in one or more of the stages of research, development, production, distribution and maintenance of defence products.

Through the activities that are developed, it constitutes an institution that presents the strategic interests of the Brazilian State, linked directly to issues related to national sovereignty and the country's economy; an economy that is structured around a set of state and private entities.

Thus, the actions of interest of the BID are directly regulated and conducted by the Ministry of Defence (MoD), through the Secretariat of Defence Products (SEPROD) which has the responsibility, among others, to propose the foundations for the formulation of the Defence Science, Technology and Innovation Policy, alongside other relevant issues related to the national defence industry.

It is important to remember that, in the private sector, most of the companies that are part of the BID are linked to the Defence and Security Materials Industries Association (ABIMDE), a civilian entity that brings together, at the national level, companies in the military sector, in addition to state-level committees that serve those companies located in their territories.

The primary mission of the aforementioned organisations is to enhance the business possibilities of their affiliated companies. They have been working directly with government authorities, especially in the military and economic areas, to increase the commercial opportunities in meeting the needs of the Armed Forces and the Security Forces of our country, which are naturally dependent on the financial resources available in the budgets.

Every new government raises concerns about the situation of the Brazilian Armed Forces – usually devoid of better equipment and dealing with the obsolescence of their materials. Hence, plans and programmes are created to solve these difficulties, to bring the armed forces into a position to fulfil their basic mission of maintaining national sovereignty.

At the beginning of the decade of 2010, the federal Government of the day launched a bold plan whose objectives, presented in two basic documents – the National Defence Policy (PND) and the National Defence Strategy (END) – were the foundation of a project to transform the Brazilian defence sector, through changes in the concept of National Security and in the context of the employment of the Armed Forces. The immediate consequences of the project,

in relation to the National Defence Industry Policy (PNID), included starting to plan the total re-equipment and modernisation of the Armed Forces, through specific strategic programmes, with an initial implementation deadline of up to ten years. However, this required that each new Government would be willing and able to implement the plan in detail and to allocate a growing amount of financial resources to do so. These preconditions have not in fact been met in the annual budgets, meaning that the initial goals of the plan were constantly postponed. There is already, (and only) at least at an early stage, the Strategic Project of the Brazilian Army with final deadline of 2035.

In national terms, in 2019, there has been a total transformation in the Government, with the emergence of a new political group with strong ex-military representation. There was an expectation that this new situation could benefit the Armed Forces and, as a consequence, the Brazilian defence industrial sector. Unfortunately, the actual situation has been the reverse, because the country faces a disastrous economic situation inherited from the previous government, compromising higher-priority sectors of national policy such as education, health and transport. Hence the current leaders have been obliged to restrict spending, including in the defence area.

As part of the solution, the 2019 budgets planned for investment in the areas of defence and security have been reduced by almost BRL3Bn (approx Euros 666M), or otherwise withheld to give priority to a general solution aiming for the recovery of the economy as a whole – a measure that is severely detrimental to many defence companies and projects – including projects that have already been launched.

In the coming months companies have to develop solutions to survive the present crisis and to be prepared for changing conditions, pursuing the objective to serve the home market, which is their national heritage, protected by the Constitution.

In the specific case of the Defence area, and to a lesser degree Security, the State has a monopoly. The State dominates purchases in this market, and it therefore is obliged to act constructively while being responsible for maintaining and developing the national industry. It is worth emphasising that the companies have to survive in a market that actually is the State itself.

With the economic measures that have been taken by different departments within the new government, altering former norms of the previous governments that jeopardised budget implementation, there is now growing expectation that in the years to come this financial crisis situation will be resolved, and better conditions are anticipated for the defence sector, especially for the defence industries.

In conclusion: today the industrial defence base – BID – continues to live in the expectation of better days.

# Bridging the Gap with Armoured Vehicle Launched Bridges

**Tim Guest**

**Armoured Vehicle Launched Bridge (AVLB) systems enable combat engineers to overcome a variety of gap-crossing challenges to help maintain the momentum of friendly forces on the battlefield.**

Keeping the way clear and unimpeded, so friendly troops can keep moving and maintain mobility on the battlefield, is a primary role of combat engineers. Clearing minefields and overcoming obstacles, for which a variety of specialised engineer equipment is available, are just two typical activities on an engineering unit's very long task sheet. Gap crossing is another and no matter how wide, from the widest river to the narrowest ravine, having the right equipment at their disposal to bridge a gap helps the combat engineer get the job done.

While spanning the widest rivers requires floating bridge systems like the M3, its smaller gaps and some of the AVLB systems in use and evolving in Europe is the basis which this article is chiefly focused.

## Gaps – No Match for European AVLBs

Gaps on the battlefield come in all shapes and sizes. Some are dry, some are wet, some are marked on the map, while others can appear unexpectedly out of nowhere, missed by the cartographers, or, perhaps,

mobility is essential. AVLBs help ensure battlefield momentum is maintained and the fight taken to the enemy.

A typical AVLB enables AFVs and IFVs to cross anti-tank ditches, blown bridges, craters, railroad cuts, canals, rivers and ravines, usually by unfolding its ready-made-bridge payload to span the obstacle in only a matter of minutes, typically without additional support equipment. The vehicle then detaches from the bridge once its in place and moves out of the way to allow the bridge to be crossed. After the last vehicle has passed, the AVLB launch vehicle crosses over itself, re-attaches to the bridge on the opposite side of the obstacle and retrieves the span before moving onwards.

Yet, while AVLBs continue to operate in the same scenarios as they always have, leading industry experts consider the AVLB market is no longer as easily categorised in terms of the traditional medium and heavy system nomenclature as it once was. More often nowadays, individual countries set their own categories. Some may categorise their assets in terms of the bridge length carried by the AVLB, such as 26m, 22m and so on. And while 'armoured' is indicative of the bridge being carried atop a tracked or wheeled AFV/IFV type chassis, a wider variety of wheeled systems are entering the space (though will not be considered in great detail in this article) with some up-armouring prior to operational deployments.



Photo: GDELS

**The newly developed COBRA from GDELS, showcased for the first time at Eurosatory 2018, is a solution for medium weight wheeled and tracked armoured vehicles.**

Mobility and counter-mobility is what combat engineering is all about and the equipment employed by these specialist troops can alter the course of a battle by keeping friendly forces on the move, while at the same time denying ease of movement to the enemy.

having appeared as a result of battle damage. Dealing with the multitude of smaller to moderate gaps anywhere from a few metres up to 60m (by deploying multiple bridge spans) or so in width, is largely the preserve of AVLB-type systems and having a choice of such bridging systems makes for more efficient and effective bridging operations. AVLBs enable vehicles of almost every kind to cross such obstacles, although it is the rapid advance of main battle tanks (MBTs), armoured fighting vehicles (AFVs) and infantry fighting vehicles (IFVs), that is key and for which unimpeded

## AVLBs – An Evolving Mix

Previous tracked AVLBs traditionally comprised converted tank chassis such as the UK Army's CHIEFTAIN AVLB of the 1970s, and were categorised largely as heavy AVLBs. That 'beast', effectively a CHIEFTAIN MBT chassis less its turret, was fitted with a hydraulic system for laying and recovering either a No.8 or a No.9 Tank Bridge. With an overall length of 24.384 m, the No. 8 bridge could span a gap of up to 23 m from one hard bank to another, or 22 m if both banks were soft.

## Author

**Tim Guest** is a freelance journalist, UK Correspondent for ESD and former officer in the Royal Artillery.



Photo: GDELS

**The MLC 80+ classification ANACONDA can support the latest and heaviest variants of the LEOPARD 2, M1A2 ABRAMS and CHALLENGER 2.**

The bridge was carried folded and launched over the front of the vehicle, whereas the shorter, 13.5 m, No. 9 Tank Bridge was carried horizontally as a complete structure and swung vertically through 180° to be laid in position over the front of the vehicle.

**UK Evolution**

The CHIEFTAIN was replaced in the UK Army by the currently-in-service, TITAN, an armoured engineer vehicle designed to enable troops and vehicles to cross gaps of up to 60 metres by laying a selection of Close Support Bridges (CSBs). Based on

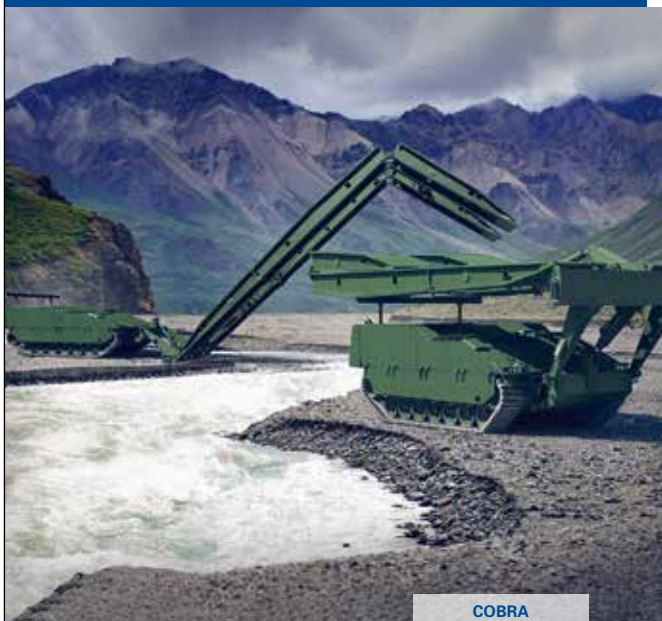
the CHALLENGER 2 MBT chassis and with a maximum speed of 59kph delivered by a Perkins CV12 diesel, the system can carry and lay the Royal Engineer’s current range of in-service BR90 close support bridges from BAE SYSTEMS, which are built from interchangeable modular components. Though originally designed for Military Load Classification (MLC) 70 tracked vehicles and supplied by BAE SYSTEMS over more than 30 years, the bridges can be crossed under controlled safety conditions by vehicles of up to MLC 85, which allows for the increase in load posed by the latest CHALLENGER 2 variants. However, the fu-

ture of BR-90 bridging is being addressed under the UK MoD’s Project TYRO with a variety of industry players currently vying for participation. Amongst other things, the project requirement is for a CSB ‘set’ that can be launched and recovered rapidly by TITAN and that has a load classification of at least MLC100 for tracked vehicles.

The BAE SYSTEMS’ approach to replacing the BR90 system has been to ‘evolve’ its BR90 bridges for the project/tender into a new Modular Bridging System (MBS), which includes CSBs for narrower gaps. (Longer modules form part of BAe Systems’ new bridge set, its General Support Bridging – GSB – though are not for deployment by the Titan AVLB). Its CSBs are its new variant No.10 (26m scissor bridge), No.11 (16m single span) and No.12 (13.5m single span) CSBs, which can be launched by Titan in less than two minutes day or night to provide a gap-crossing capability up to 24.5 m, 14.5 m, and 12 m, respectively. TITAN can also carry two No.12 bridges at the same time. Launch can take place without leaving the launch vehicle to maintain crew protection, and the upgraded bridging will meet the heavier payload requirement of the tender, thus enabling

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Photo: KMW

**The LEGUAN AVLB is based on a LEOPARD 2 chassis.**

the unrestricted use of the bridging by all UK Army vehicles, including CHALLENGER 2 and its variants. BAE SYSTEMS' MBS, as per Project TYRO's stipulations, will meet UK Army needs to 2040 and beyond.

Co-operating with BAE SYSTEMS on Project TYRO is General Dynamics European Land Systems (GDELS). If BAE SYSTEMS win any one part of the tender, CSB or GSB, GDELS will manufacture the bridges. The partnership between the two companies was announced at DSEI in 2017 when it was stated that, if successful, the new MBS bridge panels would be made by GDELS before being shipped to BAE SYSTEMS for assembly and testing.

Concerning ReBR90 bridging, its worth noting that the bridging can also be launched by the engineers' ABLE (Automated Bridge Launching Equipment) 8x8 truck, which was deployed to Afghanistan with a heavily armoured cab.

## In Widespread Use

Krauss-Maffei-Wegmann's LEGUAN AVLB was conceived initially for use on the

LEOPARD 1 MBT chassis, a version which entered service with several military customers. Now offered on the LEOPARD 2 chassis with performance capabilities commensurate with the MBT, the AVLB can carry and deploy a single 26 m bridge, or two 14 m bridges with a load classification of MLC80. In controlled and also exceptional circumstances, load classification up to MLC110 can cross. LEGUAN's fully automatic launching system enables bridges to be laid in approximately five minutes. Its horizontal launching technique maintains a low silhouette, which offers a moderate tactical advantage over those systems, which deploy bridges vertically. The whole operation is automated and performed by the driver via a system menu, but can also be performed independently by the commander. In its LEOPARD 1 configuration LEGUAN has been in operation with Belgian, Chilean, Finnish, Greek, Norwegian and Turkish rmed Forces.

In June last year, the Finnish Defence Forces (FDF) announced the modernisation and expansion of its LEGUAN AVLB fleet with the signing of a contract between KMW and

the FDF's national general contractor for the project, Patria Land Systems. This has enabled the FDF to lay short LEGUAN bridges, as well as modernising all systems to enhance performance and the future, overall viability of the system. In addition to the upgrades of its existing fleet, four new LEOPARD 2L LEGUAN systems were ordered and will carry both the 26 m and the two shorter bridge spans. The timeframe for contract activities and deliveries is from 2019 to 2021.

In March this year, Norway, which has been using the LEGUAN on the LEOPARD 1 chassis for over two decades, signed an agreement with KMW for the procurement of six LEOPARD 2-based LEGUAN AVLBs along with training simulators and a peripheral package. The delivery of these latest AVLBs will start in the summer of 2022. This makes Norway the eighth LEGUAN-using country moving from LEOPARD 1 to the next generation of the system on LEOPARD 2. At this time, armies from 18 countries are using the LEGUAN AVLB. According to a spokesman for KMW talking with ESD, the LEGUAN story began "in the mid-1980s, with Norway as one of KMW's launch customers. The fact that today the Flagship LEGUAN Leopard 2 is already in use, or has been ordered by eight nations, including Germany, underpins a level of AVLB interoperability that can be expected between these predominantly NATO nations when operational in theatre".

While LEOPARD 1 and 2 are its typical carriage vehicle chassis, the modularity of the system has enabled it to be fitted onto other MBT chassis, including in Poland on the T91, and in Spain aboard the M60/M47 MBT chassis. The US has also used it aboard the M60 and M47, but it is now chiefly carried on the M1A1/A2 as the WOLVERINE Heavy Assault Bridge. In Malaysia, it sits aboard the T-72 and PT91 chassis, and in South Africa on the OLIFANT.

LEGUAN evolved from the BIBER bridge AVLB on LEOPARD 1 and in service with the Bundeswehr from the 1970s until the LEOPARD 2 version was adopted by them in 2009.

KMW told ESD that while the regular load of today's 26 m and 14 m bridges is MLC80, there is growth potential to offer a standard MLC100 capability and that the design of the bridges not only meets TDTC (Trilateral Design and Test Code for military bridging and gap-crossing equipment) specs, but also more demanding requirements. The TDTC is used to confirm that equipment will meet the performance specified by the user, although the code requirements are seen as the minimum acceptable performance standards. Hence,



Photo: BAE SYSTEMS

**The TITAN AVLB in use with the British Army is based on a CHALLENGER 2 chassis.**



KMW stresses that the bridges go beyond these needs. For example, the bridges are equipped with load-cycle monitors for improved safety and the LEOPARD launch vehicle has an all-around vision system for day and night operations. The 14 m bridge can also be handled by medium-sized tracked AFV platforms like the CV90, as well as wheeled systems like BOXER. This compatibility with other widely used vehicles adds further to its interoperability in terms of spares and logistics on the battlefield. LEGUAN has also been integrated on the MAN 8x8 and the Finnish SISU 10x10 wheeled chassis.

KMW has stated that the 'battle-proven' LEGUAN is the 'most modern and most widespread assault bridge system' and indicated that they consider it already having become 'the assault bridge standard in modern armies'. The company expects more countries will consider LEGUAN in the coming years carried either on tracked and/or wheeled chassis.

The UK company WFEL is collaborating with KMW, its parent company, in the UK Project Tyro process, under which WFEL would manufacture the LEGUAN bridge to meet the CSB part of the tender if KMW is successful.



Photo: Pearson Engineering

**Pearson Engineering has developed an AVLB carried by the General Dynamics Land Systems 8x8 STRYKER M1132 Engineer Squad Vehicle (ESV).**

### Most Comprehensive Portfolio

Another major player in the AVLB marketplace is General Dynamics European Land Systems Bridge Systems, part of GDELS, as mentioned above in relation to its cooperation with BAE SYSTEMS on the UK Ministry of Defence's Project TYRO. GDELS has probably the largest portfolio of bridging systems in the defence marketplace, covering pretty much all cat-

egories of bridge from ultra-lightweight systems all the way up to major floating bridge and ferrying systems like the M3. In between, it addresses the ALVB market with its latest COBRA, PYTHON and ANACONDA solutions. COBRA, a brand new innovation, is what GDELS calls its Variable Folding Bridge. It is a medium AVLB designed to handle medium-weight wheeled and tracked armour traffic across a range of weight classifications.

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The bridge has unprecedented flexibility due to its 'special design', which allows it to be of various lengths depending on customer needs, as well as whichever designated armoured tracked or wheeled carrier vehicle has been chosen to carry it. In its lower length variation of 15 m, its MLC classification can support the heaviest

BRA greater mobility on the battlefield. If the bridging centre of gravity is towards the front of the vehicle, this increased weight on the front wheel/axle results in braking and manoeuvrability limitations, which is not the case with COBRA.

And with a huge choice of medium-weight AFV/IFVs in use with armies the world over,

Constructed from aluminium, PYTHON is a lightweight, dry-gap bridge offering a tactical 13 m gap-crossing capability and has been operationally proven since 2009. This combat experience has enabled GDELS to design simple-to-operate systems that can be used by just two crew members. An automated launching kit, for example, the Adaptable Bridge Launching Kit (ABLK), provides crew protection during launches when using a truck-based carrier vehicle. The kit includes: transport/launching pallets, launcher and launch boom, hydraulic system (all integrated in the pallet), electrical control system, and a diesel/electrical power source. The system was first developed in 2001, under a development contract with the US Department of Defence and delivered to them until 2010. The UK and New Zealand also use PYTHON and a contract with Ireland is currently in the delivery phase.

As for the GDELS ANACONDA, this is based on the LEOPARD 1 AVLB concept and can carry payloads of MLC 80 and above, enabling it to be crossed by current NATO MBTs, including the latest and heaviest variants of the LEOPARD 2, M1A2 ABRAMS and CHALLENGER 2. The bridge can be launched and retrieved from many different types of wheeled and tracked platforms and can be adapted to both legacy and modern tank chassis.

GDELS is convinced of the potential of its ANACONDA bridge concept and is now adapting it to be carried and deployed from any standard 8x8 truck system chassis. Typically a 22m length span, the final MLC 80+ weight class of the ANACONDA will be determined by the customer, with GDELS quietly confident about how exactly such variations can be realised in manufacture.

The company, however, sees the biggest advantage of the new ANACONDA system as being its ability to be carried, launched and retrieved from virtually any standard truck without the need to customise the basic attributes of vehicle, other than adapting it for its bridging functions. This is helped, in part, by ANACONDA being slightly shorter than similar bridges on the market. Other systems with longer bridges typically mean the carrying truck has to be modified, such as by lowering the cab in order for the longer length to clear the top of the crew compartment. The new ANACONDA is currently in its latest development stage and is due to be market-ready by mid to end 2020. GDELS sees ANACONDA's ability to be launched from standard trucks opening up the heavier weight class for any army, giving them a heavier weight class bridging asset without the need for a heavy tank chassis to carry it. ■

Photo: GDELS



**PYTHON is a lightweight, aluminium, dry-gap bridge offering a tactical 13m gap-crossing capability.**

MBTs up to and beyond MLC 100, whereas its longer version supports lower weight MLC classes down to MLC 40. Deployment of the bridge, which can be conducted by the crew in fully closed down conditions under armour, takes around two minutes. COBRA's Bridge Launch Mechanism (BLM) from Pearson Engineering, is easily adapted for integration on a variety of multi-purpose vehicle platforms. Its modular approach enables carrier vehicles to be equipped with the bridge on either temporary, using a further piece of kit from Pearson Engineering – the Jettison Fitting Kit – as well as on a permanent basis. This USP allows the armoured platform to be freed up and used for other roles on the battlefield, as necessary.

COBRA's 'special design', with the bulk of the bridge weight towards the rear, moves the centre of gravity of the whole platform towards the back of the vehicle. This allows the carrier platform to deploy a wider range of bridging in terms of weight-carrying capability, as well as length, compared with similar medium AVLB systems. Moving the centre of gravity to the rear also gives CO-

many of which would suit COBRA as a carrier vehicle, the gap in the market for a medium bridging capability is truly spanned by this system. The bridge itself is made of a high tensile aluminium alloy.

The company says the bridge design is so flexible that it can be adapted so that it fits perfectly on whichever vehicle and needs a customer chooses. And while COBRA can be offered on its own vehicles, such as the tracked ASCOD AV, or wheeled PIRANHA (of which there are over 11,000 in use worldwide), the new bridge system is totally vehicle independent, so it could be used with the likes of BOXER or PATRIA AVs.

Next on the GDELS menu is the GDELS PYTHON, effectively the latest incarnation of its former – Rapidly Emplaced Bridge System (REBS). It was primarily designed as an air-transportable, rapidly deployable bridge system to support mechanised combat units with wheeled and tracked vehicles up to MLC 50 and while not a typical AVLB, it can be carried and deployed by any medium armoured vehicle platforms and any 10/15-tonne PLS trucks, one of its chief unique selling points.

# European Armoured Military Truck Programmes

**Giulia Tilenni**

**Military trucks are essential for military operations and need to be modernised in line with the latest developments on the battlefield.**

**M**ilitary logistics have always been at the heart of military operations. As a rule, armed forces involved in operations are geographically distant from their home locations. Logistical support is essential to provide them with weapons and military equipment in addition to food and non-food items. The further away the theatre is, the more important logistics become in terms of troop support. Logistics must, therefore, adapt to deployment scenarios. In particular, efforts have been made to better align logistics with the growing need for mobility and new operating theatres. Ideally, logistics should consist of two segments: the majority of support runs along the second line, and a more flexible 'last mile logistics' supports troops operating on the front line. Nevertheless, the fact that more and more military operations are taking place in remote areas is leading to increasing demands. For example, troops involved in anti-terrorist operations in African desert areas will need additional water and food supplies as well as weapons. In this case, their logistical 'footprint' will be considerable.



Photo: Mercedes-Benz

*The ACTROS heavy-duty military truck from Mercedes-Benz was derived from a civilian platform. Various versions with 4x4, 6x6 and 8x8 configurations are available.*

## Author

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The development of increasingly powerful military transport aircraft and technological innovations, for example in the field of water desalination and purification, has reduced the im-

pact of supplies on military operations. New 'last mile' logistics solutions to increase flexibility are also being explored, including the use of unmanned solutions.

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Photo: Rheinmetall

**The RMMV joint venture of Rheinmetall and MAN has been successful in several international tenders for military trucks such as the Australian and the British. Depicted here is an SX45 8x8.**

Nevertheless, heavy military trucks remain at the heart of military logistics, making wheeled systems widely used within the armed forces. Our focus here will be on the latest developments in operational requirements and on the major European programmes currently being implemented.

### Operational Requirements for Heavy Trucks

Over the past decade, the functional principles of heavy trucks have changed dramatically. As European armies are increasingly exposed to harsh weather conditions and physical geography, the

demand for trucks that can be used in non-permissive environments is growing. The trucks offered by European companies are usually commercial vehicle designs. Compared to their predecessors, they have low life-cycle costs and low fuel consumption, which is an indispensable prerequisite for the armed forces in their constant search for cost-effective solutions – even when budget constraints are considered.

In addition, the new-generation military trucks are characterised by a high degree of modularity, which increases their flexibility and adaptability to operational requirements. In line with the requirements of the armed forces, these vehicles have integrated logistical support functions that maximise modularity and extend the operational life cycle of the vehicles regardless of operating conditions. In addition, the armed forces are particularly interested in air-transportable systems that can be moved easily overseas. Furthermore, the most recent military heavy truck programmes require armoured cabins and the use of armoured axles.

### The Importance of the Armoured Component

A growing number of defence companies are offering customers heavy armoured trucks to protect them from direct small arms fire and indirect artillery fire. In general, some level of protection against ballistic threats is a 'win'. Although the role of heavy trucks has not changed over time and remains essentially a second line duty – mainly related to logistical support – the demand for armoured military trucks is driven by two key factors.

First, increasing artillery ranges even put second lines under fire in case of attack. Second, the use in harsh operating theatres, such as Afghanistan and Iraq, where IEDs are widely used, has led users to protect logistics vehicles. The need to reduce the susceptibility of trucks to ballistic threats from explosives and mines has led to the development of an armoured undercarriage that better protects crews and payloads. Armoured undercarriages also have a positive impact on stability in rough terrain, payload and maintenance. In fact, armoured trucks can actually carry heavier payloads without damaging the structure of the vehicle.

Armoured driver's cabs and undercarriage make trucks more resilient and help to better meet the new operational requirements, thereby stimulating demand for these vehicles. As a result, the supply of the latest generation of vehicles

Photo: Iveco



**A protected Iveco TRAKKER 8x8 of the German armed forces**



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Photo: ARQUJUS



**The VLRA family of light tactical vehicles from ARQUJUS comprises of a wide variety of 4x4 and 6x6 logistics and troop carriers.**

offered by European companies has increased in recent years and several armed forces have procured such vehicles or plan to do so in the near future.

### The Supply Side

Iveco, one of the largest manufacturers of military trucks in Europe, has met the growing demand for protected cabins by developing 4x4, 6x6 and 8x8 armoured cabins, which can be mounted on the

TRAKKER chassis, resulting in more cost-effective logistics vehicles. The ballistic steel cabin replaces the commercial basic cabin. The entire range of Iveco vehicles is based on the modularity principle to allow better adaptation while maintaining an optimum combination of performance, protection and payload. This means that the user can deliver material and high quality goods as close as possible to the 'line of fire'. At Eurosatory 2018, Iveco presented the latest vehicles

developed as part of the 'High Mobility' family and is used by the Italian, Spanish and Romanian Armed Forces in various configurations. During the show, the Italian manufacturer also unveiled the TRAKKER 8x8 armoured vehicle, which will equip the German Bundeswehr. TRAKKER, one of the company's bestsellers, was also recently purchased by the Swiss Army.

The Czech company Tatra – one of the oldest in Eastern Europe – offers several tailor-made lorries enabling heavy loads to be transported and, due to the unique TATRA chassis, driven at high speed on often difficult terrain. Optimised for defence users, TATRA trucks are offered in configurations ranging from 4X4 to 12X12. A range of vehicles can be obtained in armoured versions, using cabins with ballistic and mine protection. These belong to the T-815-7 models specifically designed for military use, with the exception of the 8X8 heavy-duty chassis cabin that, in its basic version, is always equipped with an armoured cabin. Vehicles of this class can also be transported with the C-130 transport aircraft. TATRA trucks are available in a freight/troop carrier, container, truck, salvage and pontoon transport configurations. They are in service worldwide and are used for military and peacekeeping operations.

The TATRA chassis, a further development of a technology developed in the early 1900s, makes the company's manufactured chassis so powerful that it forms the basis for various MRAP vehicles, namely the French Nexter TITUS, the Czech SVOV VEGA and Brazilian AVIBRAS ASTROS. In 2017, the Danish Army selected the TATRA chassis as the weapon platform for the Nexter CAESAR 8x8 self-propelled howitzer, making it the first country to adopt such a configuration. In particular, the Danish howitzers, which are expected to be delivered by the end of the decade, will be equipped with the four-axle TATRA FORCE chassis and other technical features manufactured by the company, such as the driveline and gearshift.

The German producer Rheinmetall MAN Military Vehicles (RMMV) offers a wide range of military trucks to enhance customer logistics. As a result of their remarkable off-road capabilities and their holders specifically designed to carry special military equipment such as rifles, trucks belonging to the TGA series can support troops even in the most difficult terrains. In addition, tankers or tank tractor versions are also available. Vehicles of the HX series, developed from the com-

Photo: Zabodas



**A Tatra T815 8x8 with an armoured twin cabin**

mercial TGA class, feature high mobility and air transportability. The low-torsion ladder and the particular suspension make these trucks available in 4x4 to 10x10 variants while remaining comfortable and resistant at the same time. The strong adaptability to all military purposes is the key characteristic that made the Australian, Danish, Norwegian and Swedish Armed Forces all choose these models. As they are based on commercial solutions, these trucks are known for their limited life-cycle costs.

The company also offers two crew protection systems, namely the Modular Armoured Cabin (MAC) and Integrated Armoured Cabin (IAC). Rheinmetall also has the 6x6 YAK armoured and mini-protected multi-purpose transport vehicle on offer. Shelter's modularity allows the vehicle to be modified to fit the required mission profile. The cabin of this 13.5t-class vehicle (with 5.5 tonnes of payload) can be armoured due to an add-on baseline protection.

As a result of their century-long experience in military trucks, another German producer, Mercedes-Benz, provides a wide range of military trucks to around 80 armed forces worldwide. Their lengthy experience in the truck domain has made the company capable of developing high performing vehicles, which ensure a high operational readiness even in harsh conditions due to their chassis, traction and suspension design. In particular, their offers include any class of vehicles, weighting between three and 35 tonnes, each providing specific off-road capabilities.

The three variants belonging to the AROCS class medium and heavy duty, all-wheel-drive tractor, ALTEGO for light duty jobs, and ZETROS tractor for medium off-road capabilities. Trucks belonging to the UNIMOG class, based on the chassis of the same name, provide superior off-road performances. The 14.5t-class UNIMOG special chassis provides not only mobility and versatility but also a balanced load capacity, even in its armoured versions.

Arqus (ex-Renault Defence Trucks) offers a wide range of wheeled trucks, including two families of tactical trucks, namely VLRA and ARMIS. Vehicles belonging to the VLRA class are an evolution of the successful VLRA 1 class, with over 12,000 vehicles sold worldwide. These logistics and support carriers, available in 4x4 and 6x6 versions, respond to the requirements of the armed forces in terms of modularity, low life-cycle cost and deployability in complex environments.

The all-terrain capabilities are enhanced as a result of a low gooseneck chassis and all-wheel-drive, allowing for easy maintenance. The possibility to choose between electronised and non-electronised engines and manual/automatic drive increases the vehicles' versatility, without negatively affecting agility and contributing to easy maintenance. The different variants include also TORPEDO, a truck specifically designed for special forces' needs.

The 6x6 trucks belonging to the ARMIS class respond as well to the operational requirements of the armed forces as a result of remarkable all-terrain capabilities and the MOTS chassis. These vehicles are reported to be performing outstandingly for mounting weapon systems, equipment and supplies, for frontline logistics and troop transport. Approximately 250 vehicles are already in service with the French Army as carriers for logistic support and CAESAR artillery systems.

Scania launched last year a new generation of trucks featuring new characteristics drawn from the mix between armed forces' needs and the companies consolidated experience in trucks and engines. For instance, the R500 B6X6 vehicle,

presented at Eurosatory 2018, is a serially produced truck that has been adapted to military. Not sure the value of the sentence after the comma so suggest ending it at 'needs'. According to them, the fact that military vehicles maintain the main features and come from the same production line of commercial vehicles provides users with remarkable advantages in terms of support and costs. Another peculiarity of Scania vehicles come from the possibility to replace unprotected cabins with protected ones in less than 24 hours, and also from the fact that both cabins share the same

driver interface, therefore not requiring any form of specific training.

## The Demand Side

As a result of the considerations mentioned above, several European countries are modernising their logistic vehicles' fleets in order to respond better to their operational requirements.

The annex to the French Loi de programmation militaire 2019-2025 states that France will purchase 7,000 new trucks by 2030 to replace its ageing fleet of Renault GBC 180 6x6 tactical vehicles, which entered service some 50 years ago and reconditioned about 30 years ago. According to available details, this large programme to replace French logistic vehicles will progress slowly, as the French Army is expected to receive only 80 vehicles by 2025 – risible numbers when compared to the demands on logistics that French external operations require.

In the summer of 2017, the German procurement authority BAAINBw awarded RMMV with a €90Bn framework contract under the UTF programme, which aims at supplying the Bundeswehr with transport vehicles belonging to the five

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Photo: JELCZ

**In December 2018, the Polish JELCZ company signed a contract for the delivery of 888 JELCZ type 442.32 special high-mobility, medium capacity vehicles in 2019 – 2022.**

tonne and 15 tonne classes. The company is expected to deliver up to 2,271 vehicles belonging to the HX2 family, 558 trucks of which in the first batch, in an unprotected configuration (protections for the cab could also be added if required). In 2018, the Bundeswehr ordered 137 Rheinmetall HX81 vehicles, in addition to a first order of 32 trucks to be delivered between 2019 and 2020. In 2017, they have also renewed their fleet of Iveco vehicles (1,000 trucks supplied over the last decade) by procuring 280 EURO CARGO 4x4 (ordered in 2017) and 133 armoured TRAKKER 8x8.

RMMV vehicles are also in the inventories of the British Army, which signed a contract with the British-based MAN Truck in 2008 for the supply of Medium mobility and improved medium mobility trucks of the HX family, in six, nine and 15 tonne versions. MAN military logistic vehicles, belonging to

the UNIMOG and the TGM classes, are also in use in the Austrian Armed Forces.

The inventories of Italy, Spain and Belgium mainly consist of Iveco-produced vehicles. Spain chose Iveco as multi-purpose military truck supplier in 2015. The contract consists of 700 high mobility vehicles, belonging to different variants (4x4, 6x6 and 8x8), to be delivered over a six-year time-frame Italy also procured Iveco vehicles belonging to the High mobility class in almost any available version. Finally, the logistic component of the Belgian Army consists of Iveco M250 (2013) and EUROTRAKKER type trucks.

After a long tender for the replacement of defence vehicles, the Dutch Army had first selected Scania as participant in a competitive dialogue, and then awarded them the contract for 237 vehicles in configurations from 4x4 to 8x8. According to the country's requirements, the contract

includes support managed by Scania's facilities in the Netherlands, as the modularity that characterises these trucks establishes a strong commonality with the other Scania programmes. Vehicles for the verification and test phases were handed out in mid-2018, with deliveries expected from 2019 to 2022. Trucks will all be delivered with unprotected cabins, which can be replaced by protected ones depending on customer need.

While Poland is among those European countries that are modernising their military trucks, it decided to buy nationally due to a contract signed with Jelcz who will provide 888 special-high mobility vehicles to be delivered between 2019 and 2022. The order included the third batch of 442.32 class trucks (4x4 vehicles with six tonne maximum payload), which have been serving with the Polish Army since 2013.

### Final Remarks

Although the use of trucks for military logistics dates back to the 1900s, heavy armoured trucks have become increasingly important in today's armed forces. Although their role has not changed over time, the demand of armoured cabs is now common due to the increased range of artillery systems and the consequent impact on truck vulnerability. Armoured chassis are also becoming more important as they are at the core of the development of heavy armoured trucks, providing better protection from IEDs while allowing for sensibly increasing the payload of heavier vehicles. Armoured military trucks are expected to maintain their leading role in logistics for at least another decade to come. Nevertheless, the future of logistics lies with unmanned ground technologies that are currently under development. As armed forces search for the 'perfect balance' between cost-efficiency and troop protection, the possibility to rely on unmanned solutions will probably be a 'game changer' in military logistics. However, today's products hint that these technologies will be used for last mile logistics first, while second line duties will continue to be performed by heavy trucks for a long time. Moreover, COTS-inspired solutions for less demanding missions are likely to continue populating the most cost-effective procurement programmes in the medium term. Indeed, these technologies are not only consolidated, but also easier to maintain due to commonalities with commercial vehicles, for instance, in terms of spare parts. ■

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# More Compact, More Versatile, More Effective

## Man portable anti-tank and multi-purpose weapons

**Jan-Phillipp Weisswange**

Shoulder-launched multi-purpose weapons can be used against a wide range of targets. Miniaturisation and weight savings, modularity, longer ranges as well as more versatile and greater effect, further network capability and artificial intelligence determine procurements and further developments. In addition, the urbanisation of the battlefield has increased the importance of their use from confined or enclosed spaces.

**M**odern shoulder launched munitions (SLM) are essentially intended to serve the following purposes: engaging armoured combat vehicles up to the latest generation of Main Battle Tanks; destroying cover such as buildings and other structures; engaging targets in defilade; engaging assembled infantry; battlefield illumination; and interruption of the enemy line of sight.

Consequently, unguided and guided weapons of this type follow a modular design. This includes ammunition, firing equipment, iron or optical sights, including night vision and, if necessary, fire control systems. For guided missiles, optics and fire control system are housed in a Command Launch Unit (CLU). Even for light disposable weapons, adaptable reflex sights, laser sights or fire control units are now available. Irrespective of this, there are two basic conceptual approaches, especially in the category of unguided shoulder-launched multi-purpose weapons: reusable launchers or disposable weapons.

### From Anti-tank Rifles to Multi-purpose Weapons

The RPG-7, one of the most widely used weapons of its kind in the world to this day, serves as a reusable launcher. The 'Ruchnoy Protivotankovyy Granatomyot' (hand-held anti-tank grenade launcher;

Photo: MBDA



*French soldiers launching an MMP*

often incorrectly translated as 'Rocket Propelled Grenade') has undergone numerous modifications since its introduction in 1961. The Russian Armed Forces currently carry the RPG-7V2 variant. In addition to shaped charge (PG-7VL) and tandem shaped charge (PG-7VR) projectiles, thermobaric (TBG-7V), fragmentation (OG-7V) and anti-structural warheads (GSh-7Vt) are also available as ammunition. The RPG-7 has several modernised licensed replicas, including the PSLR-1 manufactured by the US company Airtronic.

The larger calibre RPG-29 VAMPIRE, introduced in 1989, fires the tandem PG-29V shaped-charge warhead. It can penetrate explosive reactive armour (ERA) and is said to have taken MERKAVA 3 and CHALLENGER-2 tanks out of action during the wars in Lebanon and Iraq. For the RPG-29, the TBG-29V thermobaric warhead is also available.

The US Armed Forces have had the Mk-153 Shoulder Launched Multipurpose Assault Weapon (SMAW) in their arsenal since 1984. It fires assorted 83mm calibre munitions. The weapon has been mod-

### Author

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Photos: Saab/Jan-P. Weisswange



**An extensive range of ammunition is available for the CARL GUSTAF M4.**

ernised several times by Raytheon and Nammo, with the latest, lighter-weight SMAW II SERPENT using a more modern fire control sight. Modernised ammunition types are also available.

The 84mm CARL GUSTAF, developed in the late 1940s, is used by over 40 countries. In October 2014, Saab Defence presented the latest generation CARL GUSTAF M4. As a result of the extensive range of ammunition that can be fired from the launcher, which can be equipped with fire control sights, the 'CGM4' is suitable for almost all target scenarios. The CGM4 now weighs less than seven kilos and measures less than one metre. Other significant improvements include modernised ergonomics, an integrated shot counter and faster operational readiness as the CGM4 can be carried safely while loaded. The range is just over 1,000 metres against semi-hard targets.

The slightly longer and heavier predecessor model, M3, already serves the US armed forces as the M3 Multi-Role Anti-Armor Anti-Personnel Weapon System (MAAWS). In October 2018, the US Army announced the procurement of the CGM4 as the M3E1. Saab and Raytheon also received an order to develop a new guided munition for the CARL GUSTAF. This is to have a range of around 2,000 metres and can also be used against moving targets. In 2019, the US Armed Forces signed a framework agreement with Saab worth US\$ 445M for the supply of CARL GUSTAF and AT4 ammunition.

The Spanish company INSTALAZA offers its C90-CR Reusable launcher in this segment. The empty 3.9 kg launcher can load with anti-tank, multi-purpose, smoke, anti-structure and explosive/frag-

mentation projectiles. Maximum range is up to 700 metres against area targets. At 350 metres, the anti-tank round can penetrate up to 480 mm RHA.

### For Single Use

Instalaza also offers its CR-90 disposable ammunition in its range. Depending on the type of ammunition (anti-tank, multi-purpose explosive/fragmentation, smoke, anti-structure) the weight is plus/minus five kilogrammes. The disposable weapons can also be used on moving targets at 350 metres and against area targets at up to 750 metres. The anti-tank variant can penetrate up to 400 mm RHA.

Saab's AT4 CS family is disposable too. The AT4 CS also has the 84mm calibre. CS stands for 'Confined Spaces' and indicates the possibility of using the weapon out of confined spaces. Saab currently offers the following versions of the AT4 CS: ER (anti-armour extended range), HP (high performance, higher penetration of more than 500 mm RHA), RS (reduced sensitivity, anti-tank warhead for urban or jungle combat), AST (anti-structure and breaching) and HE (high explosive anti-personnel). This ammunition family is to be fused more closely with the CGM4. The AT4 CS family is in use in more than 15 countries. The US Army introduced the weapon as M136A1. In December 2014, the French Armed Forces ordered Saab and Nexter to supply different types of AT4 CS as the ROQUETTE NG weapon system.

Somewhat smaller in calibre – 66 mm – is the Nammo M72 family, which is based on the compact M72LAW disposable bazooka of the US Army. This handy dispos-

able weapon is now available in many versions, including anti-structure variants that can be fired from enclosed spaces (FFE – fire from enclosure). The M72E11 Mk2 is also available as a programmable version with airburst function.

In recent years, the traditional Russian weapons group KBP from Tula has introduced two handy grenade weapons made of disposable cartridges with a reusable grip. The RPO-M PDM 'SHMEL' ('Bumblebee') is an improved version of the thermobaric RPO-A introduced at the end of the 1980s. Calibre and weight were reduced. The effective range was supposedly increased to up to 1,700 metres.

The 62mm Malogabaritnyy Granatomyotnyi Kompleks MGK 'BUR' (compact grenade launch system 'Drill'), which was first shown in the West at Eurosatory 2014, is even more handy. The disposable launch tubes contain either thermobaric or explosive/fragmentation grenades, and its effective range is 650 metres.

### The Modular Davis Gun Family

The more recent KBP designs follow a similar technical concept to the PANZERFAUST 3 and Recoiless Grenade Weapon (RGW) families from Dynamit Nobel Defence (DND). These consist of disposable cartridges with separate or integrated firing devices depending on the design, as well as optics or fire control units. The weapons work according to the Davis gun principle with countermass. Due to the resulting low backblast zone, they can be used from rooms and in confined environments.

Various shoulder-launched weapons from DND in calibres of 60mm and 90mm are used, for example, in the Bundeswehr. The German Special Forces use the RGW60 as PANZERFAUST, LEICHT in 60mm calibre. It is available in three versions: shaped charge (HEAT, DM52), shaped charge/fragmentation (HEAT-MP, DM42) and High Explosive Squash Head (HESH, DM62).

The DND PANZERFAUST 3 serves as the standard bazooka in the German Bundeswehr. Meanwhile, DM72A1 cartridges of the latest PANZERFAUST 3-IT type have been procured. 'IT' stands for 'Improved Tandem'. With its tandem shaped charge, the PANZERFAUST 3-IT is capable of defeating highly protected Main Battle Tanks in motion at up to 400 metres, with reactive additional armour. If the Hensoldt DYNARANGE fire control sight is used, the effective range may increase to 600 metres.

The PANZERFAUST 3 is currently being adapted for the more modern DYNAHAWK fire control sight. At the same time, DYNAHAWK serves as the optics for another versatile system from DND, namely the RGW 90 family. With the former 'Area Denial' (AD) and now Long Range Multi Purpose (LRMP) cartridge, the gunner can programme the warhead in three different versions through the DYNAHAWK fire control sight before firing: impact with and without delay and air burst mode. In service with the Bundeswehr as the WIRKMITTEL 90, the RGW90 can fire programmable multi-purpose warheads (DM11 explosive/fragmentation with impact mode/air burst mode and DM22 anti-structure ammunition with blast or mousehole effect). In airburst mode, the range is up to 1,200 metres. In addition, the Bundeswehr has procured cartridges with smoke (DM15) and IR illumination (DM16) as well as DM18 training munitions. DND, as the system leader, is responsible for the launch tube and warhead, Heckler & Koch manufactures the firing unit and Hensoldt the fire control sight with the DYNAHAWK designation. Rheinmetall manufactures the training munitions, the illumination cartridge and the smoke cartridge for the RGW 90 AD.



Photo: US Army

**In addition to the AT4-CS, the US Army currently uses the Nammo M141 Bunker Defeat Munition (BDM).**

In addition, DND currently also offers the HH (HEAT/HESH) and HH-T (HEAT/HESH Tandem) cartridges for its RGW 90 family.

Furthermore, the company continues to develop its weapon family. For example, the RGW110 has integrated the 110mm

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# RGW 110

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- Modular, scalable, effective



**The RGW90 is in service with the Bundeswehr.**

warhead of the PANZERFAUST 3 into a cartridge the length of the RGW90. INSTALAZAS ALCOTAN-100 (M2) brings it to a calibre of 100mm. Depending on the type of ammunition, this plus/minus 10kg heavy weapon also works with countermass and can be fired from confined spaces. The system consists of the reusable VOSEL-2 fire control unit and disposable launch tubes. Anti-tank, multi-purpose explosive/fragmentation and anti-bunker cartridges are available. The maximum range is 600 metres against point targets and 1,000 metres against area targets. The anti-tank projectile penetrates up to 700mm behind ERA.

### Multi-role Guided Missiles

Guided missiles, which were originally optimised for pure anti-tank warfare, had to be modernised in view of developments in protective technologies. The optional Overfly Top Attack (OTA) capability, which is available in addition to Direct Attack (DA), is now the standard. In addition, guided weapons can now be used against a wider range of targets. In many cases, the operator still controls the guided missile semi-automatically through line of sight (Semi Automatic Command to Line of Sight, SACLOS), whereby the missile receives its signals through wire, radio, laser or radar. The latest ATGMs can transmit the shooter the image of their seeker head's sensors to the Command and Launch Unit (CLU) in real time. This enables 'Beyond Line of Sight' (BLOS) operations. Fire, Observe and Update, Fire and Forget or Predicted

Line of Sight (PLOS) are also represented. The latest guided missile systems usually offer several different operating methods. Furthermore, modern CLUs offer better day and night vision capabilities while being more compact and lighter. Saab offers its Next Generation Light Antitank Weapon NLAW in this spectrum. A fire-and-forget disposable weapon, it was developed for the Swedish and British Armed Forces, but is also in use in Finland. The 12.5kg NLAW can be deployed by a single soldier from enclosed spaces. It operates with a Predicted Line Of Sight (PLOS) control. The shooter can

Photo: Jan-P. Weisswange



**Nammo M72 Anti Structure Munition Reduced Calibre**

Photo: DND

also choose between DA and OTA mode depending on the target. The range is up to 800 metres.

The Serbian BUMBAR ("Bumblebee") is also designed for short ranges. Its design is based on the French-Canadian development ERYX. BUMBAR is equipped with a 136mm tandem warhead that is designed to penetrate 1,000mm ERA. The effective range is 600 metres, while a version with a range of 1,000 metres is being considered for development.

The current version two of the RBS-56 'BoforsInfantry Light and Lethal' (BILL) from Saab Bofors Dynamics features OTA capability and can penetrate reactive armour due to two warheads. It also has a semi-hard target mode. BILL-2 offers a range of 2,200 metres.

For one of the most widely used guided missiles, MILAN, MBDA has developed the improved version MILAN ADT-ER. It features improved day and night vision and a significant reduction in weight and noise.

The French Armed Forces are currently introducing MBDA's Missile Moyenne Portée (MMP, Medium Range Missile). It has a range of up to four kilometres and operates according to the 'fire and forget' principle, but also permits 'operator-in-the-loop' procedures. Target engagements beyond direct line of sight by means of a network-centric enabled tablet computer, or through images relayed by micro-UAVs, were also demonstrated during a live firing demonstration in November 2018. The MMP can be used both from portable firing systems and from combat vehicle weapon stations. Despite its high effectiveness against a wide range of targets – including Main Battle Tanks with ERA armour – the MMP should largely rule out collateral damage, not least because of its precision.

MBDA offers the new small guided missile KLEINFLUGKÖRPER – KFK ENFORCER – for infantry and special forces, especially for the German project 'LeichtesWirkmittel 1,800 Meter+ (LWM 1,800+, light-weight effector 1,800metres and more)'. With a calibre of 90mm, it is intended to supplement the WIRKMittel 90 family used by the Bundeswehr. The KFK ENFORCER, which can be operated by just a single soldier, uses the same fire control sight as the other ammunition in this system. The range is 2,000 metres. Equipped with fire-and-forget capability and also useable from enclosed spaces, the ENFORCER's programmable warhead allows it to be used day and night against a variety of targets, including lightly armoured vehicles, sniper positions and shelters.

In this segment, Eurospike (a joint venture of Rafael, Diehl and Rheinmetall) offers a version of the SPIKE SHORT RANGE (SR). The lightweight SPIKE SR is also fire-and-forget with day and night combat capability. Its operational range is between 50 and 2,000 metres. Anti-tank, anti-structure and fragmentation warheads are available. The lightweight SPIKE SR is also 'fire-and-forget' with day and night combat capability. Its operational range is between 50 and 2,000 metres. Anti-tank, anti-structure and fragmentation warheads are available.

Eurospike is also supplying a further member of the SPIKE family, the SPIKE-LR (Long Range) guided missile, to the Bundeswehr as the 'Mehrrollenfähiges Leichtes Lenkflugkörpersystem (MELLS, multi-role lightweight guided missile system)'. MELLS can be used both mounted and dismounted. The SPIKE-LR can be used against armoured targets at distances of up to 4,000 metres. SPIKE LR also works against bunkers and mortar and artillery positions. Both 'Fire and Forget' and 'Fire, Observe and Update' are possible, so the shooter can change targets even after firing or can engage targets behind cover. Like-



Photo: Saab

**NLAW in action in Finland**

wise, the SPIKE LR can receive its target co-ordinates over a network and then engage using the Non-Line-of-Sight procedure, without seeing the target. MELLS has already been integrated into the MARDER 1A5 infantry fighting vehicle and is currently being integrated

into the PUMA infantry fighting vehicle and the WIESEL. SPIKE LR2 is a modernised version with a range of 5,000 metres.

Another latest-generation system, the OM-TAS from Rocketsan, originates from Turkey. Series production began in 2018. The day



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Photo: UK MOD



**JAVELIN of the British Army**

and night combat capable OMTAS has both 'Fire and Forget' and 'Fire and Update' capabilities and a range of 4,000 metres. Both DA and OTA are possible. With its 160mm tandem warhead, it should be able to penetrate 1,000mm ERA. The system will soon replace MILAN and BGM-71 TOW in Turkey. BGM-71 TOW and FGM-148 JAVELIN are among the other common western guided missiles. Today both come from Raytheon. The latest anti-tank effectors of the TOW, BGM-71 E (TOW 2A) and BGM-71 F (TOW 2B) are equipped with a tandem warhead and an OTA warhead respectively, which forms two Explosively Formed Projectiles. JAVELIN is a 'Fire and Forget' weapon that can engage its targets directly or through top attack. JAVELIN reaches its out-of-service-date in 2021. Ray-

theon is currently working on the successor generations, FGM-148 F with multi-purpose warheads and FGM-148 G, a modernised version with higher efficiency and better control with lighter weight.

With its BAKTAR SHIKAN developed in the mid-1990s, Pakistan has a 2nd generation anti-tank guided missile in use. It is based on the Chinese HONGJIAN HJ-8 with a range of 3,000 metres and a tandem warhead that penetrates up to 600 mm ERA.

Anti-tank guided missiles developed during the Warsaw Pact era have also undergone continuous improvement. Models such as the 9M113M KONKURS (NATO designation: AT-5B SPANDREL B, now with tandem warhead and 4,000 m range) or the 9K115-2 METIS-M (NATO

designation: AT-13 SAXHORN 2, 130mm calibre, tandem HEAT or thermobaric warhead, up to 2,000 metres range) are still widely in use. For its KORNET (NATO designation: AT-14 SPRIGGAN), KBP introduced three new 'KORNET-EM' ammunition types in 2011: tandem shaped charge, fragmentation incendiary and fragmentation warhead. The effective maximum range is said to be between 8,000 (anti-tank role) and 10,000 metres with thermobaric ammunition.

Ukraine offers the SKIF anti-tank system developed by the Luch State Design Bureau. It resembles KORNET, but is not compatible with it. Two types of guided missiles are available: 130 mm and 152 mm. Both are available with either a tandem shaped charge or explosive/fragmentation warhead. The range is up to 5,500 metres, penetrating up to 1,100 mm ERA. SKIF can be operated remotely at a distance of 50 up to metres from the weapon through its control console. Luch has also developed a lighter 107mm calibre anti-tank guided missile called the RK-3 KORSAR, which has a range of 2,500 metres.

## Outlook

Further miniaturisation, artificial intelligence and robotics are currently driving further development of the versatile shoulder-launched effectors. With a view to national and alliance defence, technologies are being developed to overcome modern armour and even active protection systems of combat vehicles. Networking with unmanned systems is another focus. For example, small drones can use real-time image data transmission to help the shooter keep an eye on the target even if the direct line of sight is interrupted. This makes it possible to react quickly to changes in the situation, such as the occurrence of previously undetected more dangerous targets, or late identification of friendly forces. Shoulder-launched multi-purpose weapons can also be used in conjunction with unmanned land and air systems. Conversely, unmanned systems – especially small and micro drones – will prove to be another target group for shoulder-launched weapons. Just as the PANZERFAUST supplemented the infantry toolbox in the past, a DROHNENFAUST (anti-drone bazooka) will probably do so in the foreseeable future.

Joint fire support may give the combat command of the future a wide range of available effectors, and there are already concepts for loitering effectors. Nevertheless, the ready-to-hand shoulder-launched multi-purpose weapon and the guided missile remain indispensable for infantry and dismounted combat forces. ■

SPECTRE 2 drone firing a KFK ENFORCER



**SPECTRE 2 drone firing a KFK ENFORCER**

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# Viewpoint from Paris



## France Manoeuvres for European Defence Leadership

David Saw

France sees its defence industry as a critical national asset, playing an important role in providing for French national defence through the provision of equipment built to meet the precise needs of the French military. The industry is also a key tool in French diplomatic and influence efforts globally, as well as being a major economic asset.

In June the French Ministry of Defence released the “Exportations d’armement: le rapport au Parlement 2019,” a report which contained French defence export statistics for 2018. In total, France exported €9.118Bn worth of defence equipment in 2018, up from €6.940Bn in 2017. This was the third best export figure since 2009, but it did not match the €16.921Bn achieved in 2015 or the €13.942Bn achieved in 2016. However, if you add together these export figures for the four years (2015-2018), it is readily apparent how financially significant defence exports are for France.

### Significant Exports

According to the government report, some 13% of French industrial employees work in the defence sector, that represents some 200,000 people. Hence the need to sustain the defence industrial base and defence technology, known by the acronym BITD in France. As far as the French government is concerned their objective is to have a BITD that is strong, broad in scope, diversified, innovative and competitive. The report makes it plain the defence exports are fundamental to the sustainability of BITD in France. The French government also notes the importance of defence exports in providing for security, regional stability and the struggle against terrorism.

For French industry in 2018, the key markets were in the EU with €2.294Bn in sales, with Belgium accounting for some €1.130Bn, and the Near and Middle East, the most important French defence market place, with €4.087Bn in sales. The major customer in the Middle East in 2018 was Qatar, with €2.374Bn in sales, followed by Saudi Arabia with €949M in sales. Between 2009 and 2018, Qatar and Saudi Arabia have purchased over €11Bn worth of French defence equipment. The fundamental importance of the French defence industrial sector is obvious, in the ten years between 2009 and 2018 French defence exports amounted to €86.226Bn. The economic impact of defence exports is plain to see. Then look at the fact that some 200,000 people are employed in the defence industry, then think

about how many other jobs these defence industry employees help to sustain. Economically and, indeed socially due to the number of workers in the industry, it is obvious that the French defence industry is a first-rank national asset. These economic and social factors, added together to the strategic importance of a strong national defence industry to meet the needs of the French military, further emphasise the critical nature of this industry.

### Industrial Collaboration

There was a time when French industry was totally in charge of its own destiny, today that is no longer the case. The reality of the situation is that the industrial environment is one of international collaboration, in particular, European defence industrial collaboration. France was quick to realise that it was necessary for Europe to take a collaborative approach to advancing its defence technology and preserving its industrial base. This led to rationalisation in the French industry to create powerful national champions, these national champions would then go on to form the basis for pan-European industrial champions.

The end result of these trends was Airbus, MBDA in the missiles sector, KNDS in ground systems and the recently created Poseidon project which sees the creation of a joint venture operation in naval ship building between Fincantieri and Naval Group. One should also not forget that Thales can be considered as a global player in its own right, nor should other French industrial primes such as Safran and Arqus be ignored either.

The logic of European collaboration in the design, development and production of defence equipment cannot be faulted, but domestic European markets will not be enough to sustain the European defence industrial base, and this means that exports are essential. However, this brings matters into problematic territory as different European states have different rules and opinions on defence exports. As we have seen, France views defence exports as being posi-



tive in both strategic and economic terms, in contrast France sees the German view as one where defence exports are seen through the prism of arms control.

In the past France and Germany have managed to find common ground as regards exports of jointly manufactured defence equipment. This Franco-German understanding on defence exports was swept away, as Germany imposed an arms embargo on Saudi Arabia in response to the murder of Saudi journalist Jamal Khashoggi in the Saudi consulate in Istanbul in October 2018. The embargo covers the sale of new equipment, as well as supply of the supply of spares, and modernisation, repair and overhaul services.

From the French perspective, it was German domestic political considerations that were the primary factor that led to the Saudi embargo. The fact that the embargo was imposed without reference to France, and the lack of any consideration of the damage that it could do to French national interests are considered to be extremely worrying developments. Added to which there is the economic damage caused by the embargo, for example, Airbus in its mid-year results indicated that it had taken a charge of some €200 million due to being unable to fulfil a security contract in Saudi Arabia.

## Future Dangers

France has long been a supporter of increased defence and security cooperation in Europe, hence its support for the creation of pan-European defence corporates. The creation of a strong European defence industrial base and the sustainment and future development of a European defence technology base are seen as critical for European sovereignty. The next stage of this process was to see France and Germany act as the leaders in major new European defence programmes, to which other European nations would join as required.

In the ground systems sector, the primary programme being driven by this Franco-German defence industrial alliance is the MAIN GROUND COMBAT SYSTEM (MGCS). The MGCS will replace the LECLERC and LEOPARD 2 tanks currently in service. In the air systems sector the primary programme is the FUTURE COMBAT AIR SYSTEM (FCAS), this includes the development of a NEW GENERATION FIGHTER (NGF), a sixth generation combat aircraft, as a part of a complete system of systems that also include Remote Carriers for the weapon systems, and an Air Combat Cloud to provide a networked capability. Spain is now formally part of the FCAS programme.

## The FCAS Programme

FCAS, which is known as *Système de Combat Aérien du Futur* (SCAF) in France, will be a revolution in European air combat capability. It will replace the RAFALE and TYPHOON in service from around 2040, with the new system also being carrier-capable to replace the RAFALE M in service with the French Navy. FCAS/SCAF is going to be a technically demanding and doubtless expensive programme, this is inevitable as this programme is the future of advanced military aerospace in Europe.

To sustain a programme of the size and cost of FCAS/SCAF there is

no question that exports will be absolutely essential. The same logic applies to other programmes such as MGCS. What is worrying Paris is that the unpredictable nature of German policy towards defence exports could torpedo the export possibilities of these major programmes. France believes that this would have serious consequences for European defence collaboration and be a serious blow to European sovereignty.

Another significant issue in the context of FCAS/SCAF is the industrial aspects, as in who will lead and who will follow, and, of course, the industrial workshare that partners will receive. In FCAS/SCAF, France will be the lead with Dassault as the prime. Where matters will become complex is when the decisions are made over engines, avionics, weapons and other critical systems for FCAS/SCAF. For France, if you

Photo: Airbus



**The mockup of the NEW GENERATION FIGHTER (NGF) element of the FUTURE COMBAT AIR SYSTEM (FCAS)/ *Système de Combat Aérien du Futur* (SCAF) was unveiled on the first day of the Paris Air Show in the presence of President Macron and the defence ministers of France, Germany and Spain.**

are talking about combat aircraft and associated systems, they are without doubt the European leader in the design, development and production of such systems. As such they see the totality of FCAS/SCAF being led by French industrial primes.

Major European defence industrial cooperation programmes do not have the best of records for providing the systems required on time and on cost. For France it is imperative that FCAS/SCAF delivers in terms of capability and cost. They are not prepared to take risks in terms of the future of their defence industrial base, hence their perception that French industry should lead. Equally they are not prepared to accept the fact that Germany can unilaterally decide on where FCAS/SCAF can be exported, without reference to France. Resolving the political and industrial aspects of FCAS/SCAF and the other major future Franco-German defence programmes has just become even more complicated.



Images courtesy of JGSDF, JMSDF and JASDF Official Website  
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# Image Fusion Promises to Maintain the Night Time Combat Edge

**Doug Richardson**

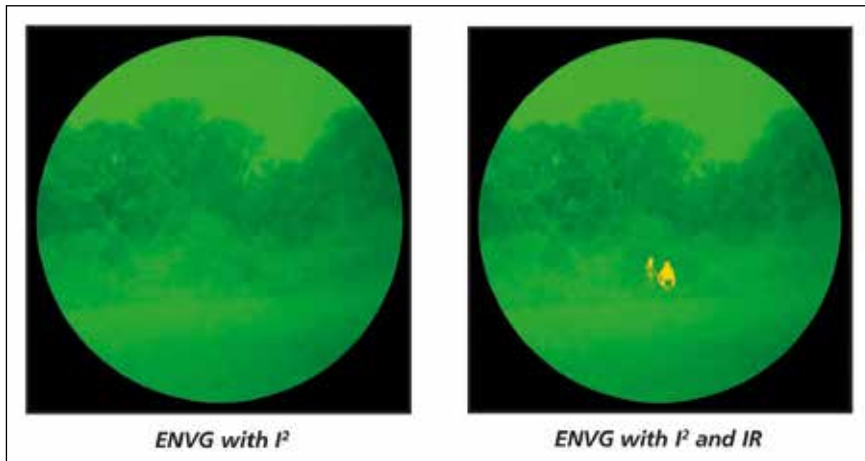
For the front-line soldier, the most common night-vision (NV) system is the night-vision goggle (NVG). Following the Desert Storm campaign in 1991, NV systems were credited with having been essential for the coalition's success against Iraq.

They gave soldiers the ability to fight at night, and were particularly effective when engaging an enemy who lacked such combat aids. But that night-combat superiority has been eroded over the last quarter of a century. When US-led coalitions began

maintain these in substantial numbers. Breaking this potential deadlock depends of fielding higher-performance sensors that can cope with poor conditions such as the presence of dust or smoke. This would allow friendly forces to purposely create extremely de-

moonlight or starlight. This energy is focussed onto the input photocathode of an I2 tube. When the incoming photons strike the photocathode, they release electrons which can be amplified, then reconverted to create a visible display.

Early I2 tubes were classified as Generation 0 (Gen 0) and Generation I (Gen 1). Their size and weight did not allow early NV systems to be made small enough for infantry use. The 1970s saw the introduction of Generation II tubes which incorporated a new element known as a microchannel. Located ahead of the photocathode, this was a thin disk made from millions of microscopic-sized parallel glass rods stacked in a bundle. As electrons passed down the rods, some struck the walls of the tube, and these impacts released a shower of secondary electrons, which in turn generated more collisions with the wall and yet more secondary electrons. Gen 0 and Gen I tubes had a low gain, so several had to be connected in series in order to create a useable HV



*The AN/PSQ-20 ENVG allowed a thermal image (seen in yellow) to be superimposed over a green-phosphor image-intensified display.*

operations in Afghanistan and later Iraq, they faced an enemy that had been able to acquire small numbers of older NV systems. In subsequent years, ISIL combatants and other US enemies have been able to obtain growing numbers of high-performance NV systems, eroding the tactical advantage that Western forces had enjoyed during night operations. In today's world, NVGs are being manufactured by at least 17 nations, so enemy forces down to the level of insurgents can ob-

graded conditions that would severely degrade an enemy's NV capabilities.

## Image Intensification

Two techniques are widely used by NV systems – image intensification (I2) and thermal imaging (TI). Image intensification systems use an objective lens to collect whatever tiny amount of light and near infrared is available at night from sources such as



*Prototype examples of the ENVG III night-vision goggle and FWS-I weapon sight*

## Author

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

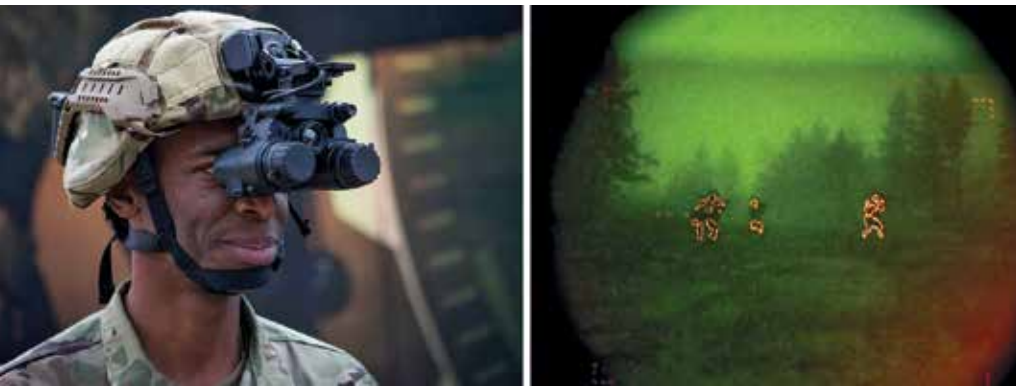


Photo: US Army

**The ENVG-B NVG combines image fusion and a binocular configuration.**

The performance of Gen III devices has been boosted by several technological developments. The use of an automatic gated power supply system regulates the photocathode voltage, giving the device the ability to rapidly adapt to changing light conditions – for example when the user is moving between high-light to low-light environments. It also helps a tube used on a weapon sight to cope with muzzle flash when the weapon is fired. The use of a much thinner ion barrier (or even no ion barrier) can minimise image noise but reduces the life of the tube by around 25 percent. While manufacturers sometimes promote these "filmless and gated" tubes as being Gen IV, the US military uses the term GEN-III OMNI-VII.

Photo: BAE SYSTEMS



**Imagery from the FWS-I weapon sight can be displayed as an overlay in the output of the ENVG III night-vision goggle.**

system, but a single Gen II tube has a gain of around 10,000, so can provide good imagery in extremely low light conditions, such as a moonless night. First fielded in the 1980s, Gen III tubes use a photocathode made from gallium arsenide rather than the multi-alkali material used for Gen II devices. They have a high level of performance at wavelengths of

between 0.6 – 0.9 microns, so are better able to exploit night-sky radiance (which increases with wavelength and peaks at around 1.1 microns) than the Gen II tubes (whose response declined from 0.5 microns and was minimal at 0.9 microns). Gen III devices also have a longer life than their Gen II counterparts, but are more expensive.

### Thermal Imaging Systems

Thermal imaging systems sense the temperature difference between an object and its environment by converting infrared radiation into visible light. The earliest examples typically used moving mirrors to scan the external scene, a technique that allowed the use of relatively simple detector elements. However, the breakthrough that allowed the fielding of low-cost imaging systems was the development of two-dimensional (2D) arrays of IR sensors in which each sensor could be dedicated to each pixel in the display, eliminating the need for a scanning mechanism. The development of uncooled arrays began in the early 1980s, and led to the development of microbolometers, the thermal-imaging technology used in NVGs. Although I2 sensors provide high resolution, TI sensors provide a longer target-detection range, and can allow the user to see through smoke. They can also provide a clearer image than is available from an I2 system if the latter is being used in a low-contrast environment.

### Image Fusion

The breakthrough that the US DoD hopes will restore the edge in night time combat involves combining thermal and I2 imagery in a single device that will give soldiers the ability to exploit the best features of both techniques. One of the early systems created to exploit image fusion was the ITT (now Harris) AN/PSQ-20 Enhanced NVG (ENVG). Designed to combine the outputs of a 16-mm I2 tube and a 320 X 240 pixel microbolometer, it was intended to replace the older AN/PVS-7 and AN/PVS-14 systems. Approximately the same size as the AN/PVS-14, it used a similar



Photo: Thales France

**A decamouflage mode allows the MINI-DIIR to highlight potential targets.**

control layout in order to simplify training. Fielded in 2009 as the ENVG I, the AN/PSQ-20 entered service on only a limited scale. It was much heavier than the PVS-14, and drained batteries quickly.

The AN/PSQ-20 formed the basis of the AN/PSQ-20A Spiral Enhanced Night Vision Goggle (SENVG) system that was developed under a 2010 DoD contract intended to meet the US Army's ENVG II requirement. It used a separate battery pack that allowed helmet-mounted or hand-held use, and incorporated a colour microdisplay.

Another 2010 contract awarded to what was then Northrop Grumman EOS (now L3 Warrior Systems) under the ENVG III programme covered an alternative design designated AN/PSQ-20B. Earlier iterations of the ENVG had two modes – fused vision, or image intensification only. The ENVG III added more modes to the thermal imager to enhance target detection capabilities. It can show either the I2 or thermal imagery, or be used in one of three fusion modes – overlay (which showed the hotter parts of the thermal image), outline (with thermal imagery given a bright white outline that makes them easier to see, and full fusion (which combines the full output of the I2 and thermal channels).

A second ENVG III design was developed by BAE Systems. According to the company, it uses 12-micron TI technology to produce sharp thermal images, and was optimised for low power consumption.

### Imagery from the Sight

A second technological trend is the ability to connect NVGs to the sight on the soldier's weapon, allowing the user to aim the weapon without bringing it up to his shoulder, or point the weapon around a

corner, acquiring a target without exposing himself to enemy fire. One major feature of this third iteration of the ENVG concept is that it can be wirelessly linked to the Family of Weapon Sights-Individual – a capability first tested by US Army personnel in 2017. Imagery from the sight is displayed in a 19 degree wide secondary image that is superimposed over the main image. The FWS-I can be mounted on a range of personal weapons such as the M4 carbine, M16A4 rifle, M249 Squad Automatic Weapon, M136 AT4 light antitank weapon, and the M141 Bunker Defeat Munition.

### Binocular Devices

Many older NVGs are monocular, providing imagery either via a single eyepiece or from two eyepieces that share the output from a single tube. With the latter configuration, both eyes see the same image, so there is no stereoscopic effect and no depth perception. Having a two-channel binocular system in which each eye receives an independent image from its own tube provides perception of depth. However, the tubes needed for a binocular configuration are likely to be physically smaller than that needed for a single-tube biocular design, so will gather less energy than the larger tube of a good binocular NVG, and have a lower resolution.

Most current NVGs techniques produce monochrome images from green phosphor technology, but some more recent designs use white phosphors in order to display a more eye-friendly image that makes object recognition easier, and that does not create spurious colours when the user takes the device off after using it for several minutes (magenta if you look

Photo: Thales France



*Thales France's MINI-DIIR is a clip-on attachment for the company's MINIE-D (Miniature Night Intensified Equipment - Display). The combination provides a fused thermal and I2 image.*

at a light area, or green if you look at a dark area).

The Request for Information (RFI) issued in January 2018 for what would become the Enhanced Night Vision Goggle – Binocular (ENVG-B) specified that the system was to incorporate dual white-phosphor I2 tubes and an integrated thermal imager. It should provide fused imagery, and under normal conditions, target recognition of an upright moving man was to be possible 80% of the time at ranges of up to 400 metres. In conditions of limited visibility (such as fog, salt fog, haze, mist, snow, dust, smoke and other battlefield obscuring agents), it was to be possible 90 per-

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cent of the time at ranges of up to 50 metres. An integrated full-colour micro-display was to have a format of at least 1280x960 pixels.

### Wireless Interfaces

A multi-point wireless interface for subsystems such as the Family of Weapon Sights – Individual (FWS-I) is intended to allow the import of the weapon sensor reticle and video into the goggle, along with data from a handheld targeting sensor, navigational aid,

tract to produce the Enhanced Night Vision Goggle–Binocular (ENVG-B).

### Clip-on Attachment

One alternative to procuring an NVG that provides fused imagery is to mount a clip-on thermal imager in front of the optics of an I2 sensor. An early example of this approach is the Clip-On Thermal Imager (COTI) developed by Optics 1 (now part of Safran Vectronix) for use on the AN/PVS-15 binocular NVG. Safran Vectronix's Thermal

Acquisition Clip-on System-Miniature (TACS-M) extends this concept to fit a wide range of NVGs, including the AN/PVS-7, AN/PVS-14, AN/PVS-18, and AN/PVS-23. It uses an uncooled 320 x 240 pixel MWIR microbolometer to overlay a thermal image onto the I2 output.

A similar approach as taken by Thales Angénieux (now Thales France) with its MINIE-DIR. Based on an uncooled LWIR 384x288

Minie D NVG has a threshold or “decamouflage” mode that brightens all human-range temperatures. This is intended to make soldiers stand out more on a cluttered thermal background. Minie D also incorporates an integrated OLED video array which allows external data such as weapon sight images or maps to be displayed. Addition of the MINIE-DIR allows the combined system to show the wearer a partial (Improved Menace Detection) or full IR image.

NVGs do not magnify the external scene, but present it at the same scale as the naked eye. However, their field of view (FOV) is much less than the naked eye, usually around 40 degrees. Gather up a dozen leaflets on NVG systems at the next defence exhibition that you attend, and you will find that in almost all cases, the FOV specified is 40 degrees.

### Wide-angle Systems

This narrow FOV deprives the NVG user with the peripheral vision needed to provide situational awareness. As a result, the wearer must perform aggressive head scanning in order to maintain minimal situational awareness, and this can result in neck strain. The restricted FOV also makes navigation and orientation difficult, particularly in unfamiliar terrain. Not surprisingly, these limitations have spurred work on wide-angle systems that extend the angular coverage well beyond 40 degrees.

An early example was the Clara NVG from what was then SFIM. This had a 50 degree FOV. More recent instances are the Meopta MonoKlara (with a 50 degree FOV), and the Thales France MONIE (MONocular Intensified Equipment) and OIP Sensor Systems FELIS NVGs (both with a 51 degree FOV).

One method of providing a wider FOV is to base the NVG on a horizontal array of four tubes. This extends to FOV to just over 90 degrees. In the 1990s the US Air Force adopted four-tube NVGs for use on aircraft such as the A-10 Thunderbolt II, MC-130 Combat Talon and AC-130U Spooky, but the concept soon became operational with various special forces. Four-tube NVGs currently being marketed include the Ground Panoramic Night-Vision Goggle (GPNVG) from L3 Warrior Systems. This uses multiple 18mm I2 tubes to provide a 97 x 40 degree FOV.

One potential problem with horizontal arrays of tubes is the regions of the image in which the FOVs of two individual tubes must merge. When the cinema industry used a horizontal array of three projectors to display imagery originally captured by an array of three cameras, this Cinerama pioneering wide-screen process suffered from problems in the areas where the images overlapped.

Photo: Tactical Night Vision Company



**An array of four I2 tubes gives the GPNVG-18 a wide field-of-view capability.**

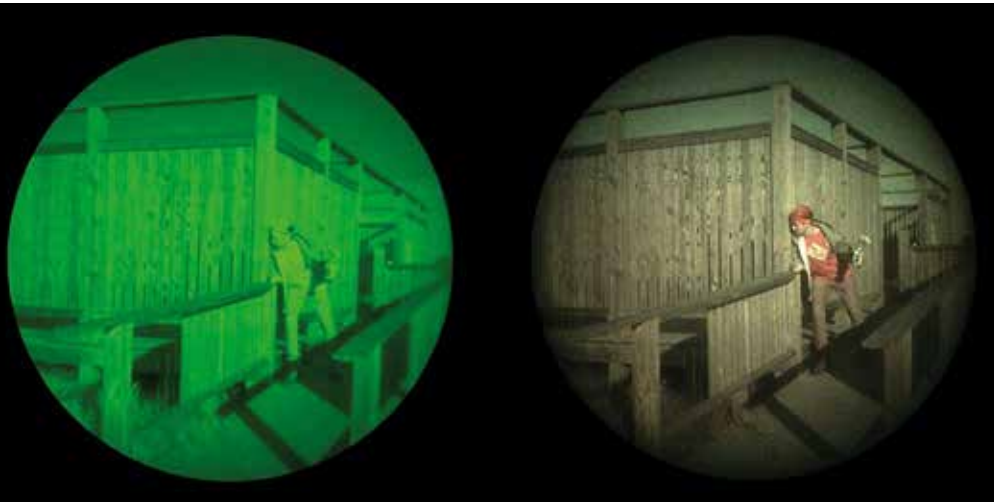


Photo: Chromatix

**The colour imagery created by the GEMINI rotating filters may not match the standards we associate with classic colour films such as Kodachrome, but this view of a suspect armed with what looks like a Molotov cocktail improvised incendiary device shows the potential usefulness of colour night vision.**

the NETT Warrior (formerly known as the Ground Soldier System) situational awareness (SA) system.

The plan called for the delivery of up to approximately 40 prototypes for Engineering and Manufacturing Development (EMD), to be followed by approximately 90,000 full-rate production systems over a seven-year period. In 2018 the US Army awarded L3 Technologies a three-year, US\$391M con-

tract to produce the Enhanced Night Vision Goggle–Binocular (ENVG-B). array, this is a clip-on attachment for the company's MINIE-D (MINiature Night Intensified Equipment – Display). Selected to form part of France's FELIN (Fantassin à Equipments et Liaisons INTégres) future soldier system, the MINIE-D incorporates an OLED (organic light-emitting diode) display able to handle externally-supplied information, including weapon-sight imagery.

So it was hardly surprising that Cinerama was soon replaced by wide-screen systems that used a single camera.

History seems likely to repeat itself. One potential problem with four-tube NVGs is that the imagery from two overlapping fields of view may not overlap perfectly, while the image height at the overlap is restricted. A wide-FOV unit based on a single tube would avoid these limitations. In 2016 Kent Optronics was given a contract by the US Navy to develop the Wide Field-Of-View Foveal-Night Vision Goggle (WFOV F-NVG). This is a two-tube binocular that uses a wide angle foveal eyepiece and foveal objective lens to deliver an 80 degree FOV from each of the Gen III image intensifier tubes.

### Colour Vision

It is hardly surprising that some NGV users would like to see the introduction of systems offering colour vision. This could help soldiers tell the difference between friendly forces, enemy personnel or civilians, or in peacekeeping operations could help sentries tell whether the colour of an approaching vehicle matched that of one on a 'be-on-lookout' list.

Some early experiments showed promise; in 1995 MIT Lincoln Laboratory reported that imagery from the visible through near IR band from a Gen III image intensifier tube combined with thermal IR imagery from an uncooled thermal imaging array showed what was described as "remarkably realistic colour renderings of night scenes".

Several of the earliest systems for creating colour cine films were based on rotating colour filters mounted ahead of the lens of the cine camera used to capture the scene, and the lens of the projector used to display the finished film, so perhaps in it not surprising that the US company Chromatira has adopted a similar solution in order to create an NVG that creates a colour image. Intended for use with an existing I2 device such as the AN/PVS-14, its CVA-14 Colour Enhancer is a clip-on system that positions rotating filters in front the lens and between the eyepiece of the user's eye. Although the colour rendering is degraded by the lim-

ited spectral coverage of current I2 technology, the system produces useable imagery. Another approach to colour night vision is demonstrated by the Adams Industries' SENTINEL-CNV NVGs. Designed for use by the US Special Forces, and deployed since 2003, these use I2 tubes which the company says "utilise proprietary modifications to deliver meaningful and repeatable colour contrast at low light levels associated with night-time operations. The goggles are optimised to present more lifelike colour under moderate illumination conditions, and better contrast under all conditions."

### Outlook

Inevitably, new capabilities such as image fusion and colour vision will become more widely available that at present, so the combat edge that they offer will decline. So once again, new NV technologies will be needed. If today's state-of-the-art NVGs fuse imagery from two frequency bands, next-generation NV technologies could involve three or even more bands. This will inevitably raise potential problems in terms of bulk, weight, and power consumption, but could maintain the West's superiority in night combat. ■

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# New Mortars for the Danish Army

**Michael Johnsson**

**When fighting a peer or near-peer adversary, there is always an imminent threat of counter fire in response to your mortars or artillery engagement. Radars and drones in all variants have proven to be effective assets in providing target information.**

To defend the counter-fire threat, the Danish Army will have to change the way we deploy our heavy systems:

- Keep the crew protected during engagement;
- Hiding from drones and other reconnaissance assets in any possible way when not executing a fire mission.
- Expose the system as short as possible during firing.
- Keep the unit's systems physically separated during the fire mission to make them a less attractive target.
- Leave the firing position immediately after firing the last round.

This is old news, but has become more relevant than ever since 2014, when a number of case studies from Ukraine showed what happens when you keep your heavy mortars or artillery in a static position for a longer period.

To fulfil these "new" requirements, the Danish Army will take advantage of a lot of new technology elements over the next couple of years. This article looks at the new CARDOM 10 120mm mortar system:

## PIRANHA 5 – Mobility and Protection

In order to keep the crew well-protected and to provide the best possible mobility for the weapon system, the mortar has been integrated with the Danish Army's brand-new armoured personnel carrier. The Danish Army decided to replace its fleet of M113 and PIRANHA 3 vehicles with the brand-new PIRANHA 5 from General Dynamics European Land Systems-Mowag in 2015. The PIRANHA 5 offers a very high level of mobility and protection. The vehicle will be delivered in different configurations, adjusted to different army requirements and

### Author

**Major Michael Johnsson** is Head of Mortar Element, 1 Artillery Battalion, Danish Artillery Regiment



Photo: WEBEL

**The CARDOM 10 prototype with the MVR-700SC positioned underneath the barrel**

applications: Infantry, Engineers, Medical Service, command postvehicle and others. As the latest variant the mortar version was tested in the western part of Denmark during the first half of 2019. The Army will receive a number of PIRANHA 5s with a floor-based mortar. The mortar of choice is Elbit's CARDOM 10.

## CARDOM 10 – Autonomy and Accuracy

One way to reduce the threat that the mortar team is exposed to hostile reconnaissance is to introduce systems that help to reduce the time spent on laying the mortar. The CARDOM 10 is a fully autonomous 120mm soft recoil mortar system. The system delivers effective fire support by combining the flexibility and effectiveness of accurate mortar fire with the exceptional tactical mobility of the PIRANHA 5. This combination allows the commander to deploy his systems in different formations depending on the threat including all formations from close together to spread over a larger area, thus forcing the enemy to use more resources to engage the unit.

The CARDOM 10 is a derivative of the combat-proven 120mm CARDOM which is an open hatch, muzzle loaded and turntable mounted mortar used by the US Army, the Israeli defence forces and other countries.

### Muzzle Velocity Radar (MVR)

Each CARDOM 10 mortar system will be equipped with a MVR-700SC muzzle velocity radar system from Weibel in Denmark. Many parameters, such as temperature, humidity and barrel conditions influence a mortar bomb's muzzle velocity. It is pivotal to compensate for these parameters and improve accuracy by adjusting individual mortar settings according to precise measured muzzle velocity. The radar system is integrated with the FCS and consists of an antenna and a processor. The antenna unit contains all necessary electronics and an acoustic trigger. Its trigger and Doppler signals are digitised by the processor unit and stored for digital analysis.





Photo: Danish Army

### Final Test and Delivery

The complete system was subject to an extensive test programme from February until July of this year, including mobility tests and applying maximum stress on the weapon. The noise and pressure during engagement were measured to provide best possible environmental conditions for the crew. The tests also included live firing in tactical scenarios to consider the overall performance. These scenarios were based on the “shoot n’ scoot” principle. The system met all requirements for fast and accurate fire and proved to be a very effective system for the future – ready to meet the “new” threats on the battlefield. The systems will be organised in platoons with four systems in each platoon in support of the infantry battalions. The first systems will be delivered in the early part of 2020 with deliveries to be completed at the beginning of 2021. ■

**PIRANHA 5 with integrated CARDOM 10 during firing tests. The three crew members are well protected inside the vehicle while operating the mortar. The crew includes the commander and a driver.**

CARDOM 10 uses a longer barrel in order to achieve ranges of up to 10 km with extended range ammunition. This explains the designation CARDOM 10. The mortar utilises an auto-laying system based on an electric drive for elevation and traverse, also enabling MRSI (Multiple Rounds Simultaneous Impact) capabilities. In case of a power supply failure or a breakdown of the computer or navigation system, the mortar can be laid manually using the backup handles and an optical sight unit known from the ground-based systems.

The Fire Control System (FCS) is based on NATO’s S4 software. Combined with meteorological information (METGM or METCM) and information from the muzzle velocity radar the FCS provides a very high accuracy level. In combination with the auto-laying of the mortar, this technology will improve firing accuracy and reduce the need for adjusting the fire before fire for effect.

These are major steps to reduce time in the firing position and to avoid the possibility of a counter fire. The FCS is interfaced to the Army’s battle management system and the call-for-fire procedure is now based on digital communication means. If needed, the observer can call for fire via voice-communication, too. Besides, the system is equipped with a semi-automatic loading system that enables the crew to easily control and fire with a rate of up to 10 rounds per minute. Compared to manual loading of the mortar the loading system reduces the physical stress on the crew, thus improving the team’s effectiveness.



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# Recognising the Importance of Cabling and Connectors

**Tim Guest**

Today's hybrid battlefield is connected and networked like never before and military cables and connectors have major roles to play in ensuring the latest land, maritime and aerial systems and applications work effectively.

With more electronics underpinning the modern battlefield than in the past, the cables and connectors that have kept military equipment connected over many years of modern warfare are more important than ever before. This article looks at some of the background on the

and equipment using the latest electronics and sensors, often from both defence and consumer industry sources, which have come together to deliver next-generation solutions to next-generation threats. All of these scenarios rely heavily on appropriate, high-performance and reliable cables

and spike in demand as well as the use of micro- and nano-sized latching connectors suited to the job.

Another current-day application of increasing importance is the use of military robotics, such as remote bomb-disposal robots and IED detection systems. These systems conduct activities such as image capture and transmission, together with remote firing/detonation activities. The cables and connectors used to effect these roles need to withstand severe shock, vibration and water ingress, as the platform moves over often uneven and waterlogged terrain. Their cabling and connectors must ensure reliable and even distribution of power throughout the robotic vehicle and maintain constant contact within the connector. In such cases, pin-and-socket systems with spring beryllium copper or twisted stainless steel are now typically used to maintain contact, with each pin-and-socket set first nickel plated and then gold plated, in order to retain contact reliability.

Photo: ODU



**The ODU AMC® EASY-CLEAN plug includes contacts that can be easily and quickly cleaned in the field even under the most unfavourable conditions, guaranteed by a connector design based on real-world conditions and the use of the "pogo pin" contact system. In the unmated state, the connector contacts lie flat and can therefore be very easily cleaned.**

importance of military connectors and cabling that is as relevant today as ever, and how today's applications are driving developments.

## The Need

From new soldier systems to latest vehicle, airborne, marine and space-based platforms, the hybrid battlefield of today and tomorrow is awash with new applications

and connectors that meet the right specifications to deal with the demands of the modern battlefield.

Fast-moving Unmanned Aerial Vehicles (UAVs), for example, carry sophisticated electronics for navigation, as well as a variety of high-resolution cameras, sometimes together with ammunition and weapon control systems. To ensure this all works on a platform that can be moving in excess of 200kph, high signal speed and integrity must be maintained. In this sense, in order to make the cable connections between the data storage modules (on which these systems rely), miniature, ruggedised connectors with small diameters that exhibit high speed differential signal processing are used. With such applications on the rise, there has been a noticeable

## Yesterday's Pioneering Efforts Relevant Today

To understand where the military connector and cabling sector is today, it is important to take a look at how we got here. Back in the 1960s, the US company Raychem's work on x-ray and radiation technologies discovered that if you irradiate certain polymers it changes their structure making them more heat resistant and/or more chemical resistant. This technique was applied to the making of wire jackets so that they were tough and resistant to harsh treatment (such as exposure to aviation fluids). However, it also meant the jackets could be made extremely thin, eliminating up to 70% of the jacket material previously used to encase a wire. So, while a wire cable, (when deal-

## Author

**Tim Guest** is a freelance journalist, UK Correspondent for ESD and former officer in the UK Royal Artillery.



Photo: Fischer Connectors

**Vehicle electronics and sensors place high demands on connectors and cabling.**

ing with things like wire bundles in aircraft), still had the same copper content, to be able to remove 50-60 per cent of the weight using the new jacket material was a massive breakthrough in aircraft weight reduction. These developments led to Raychem's MIL-SPEC 44 Wire, which evolved over several years for military and aerospace requirements that demanded complex circuitry and high-density applications and into what is today, known as Raychem TE Connectivity SPEC 44 Wire. This remains the *de facto* standard for thin-wall wire adopted for military ground systems and is also widely used in aircraft avionics, other commercial and military electronics, helicopters, satellites, ships, trains and offshore platforms where environmental conditions demand consistent and reliable performance. SPEC 44 features a dual-wall construction that blends the excellent mechanical and chemical properties of radiation-crosslinked polyvinylidene fluoride (PVDF) and the outstanding physical and electrical characteristics of radiation-crosslinked polyalkene.

The insulation system features copper conductors (tin, silver, nickel or aluminum coated) beneath a primary insulation of radiation-crosslinked, extruded polyalkene and topped with a radiation-crosslinked, modified PVDF jacket.

The same team at Raychem then discovered, some time later, that by removing the copper wire they were left with a heat-treated tubing with which they could produce heat-treated mouldings and other shapes, known as moulded parts. This is how military harnesses for AFVs, as well as cabling systems onboard naval ships emerged. Effectively, anything where cables are used under extreme conditions, such as MBTs and SP guns, were crying out for such a product.

Typically, cabling at that time terminated with MIL-DTL-38999 round green connectors, originally developed by the US Department of Defence (DoD) in the 1930s, and employed all sorts of ways of joining them together. Braid and heavy tape wraps were often used, but they were not waterproof nor abrasion-proof and elec-

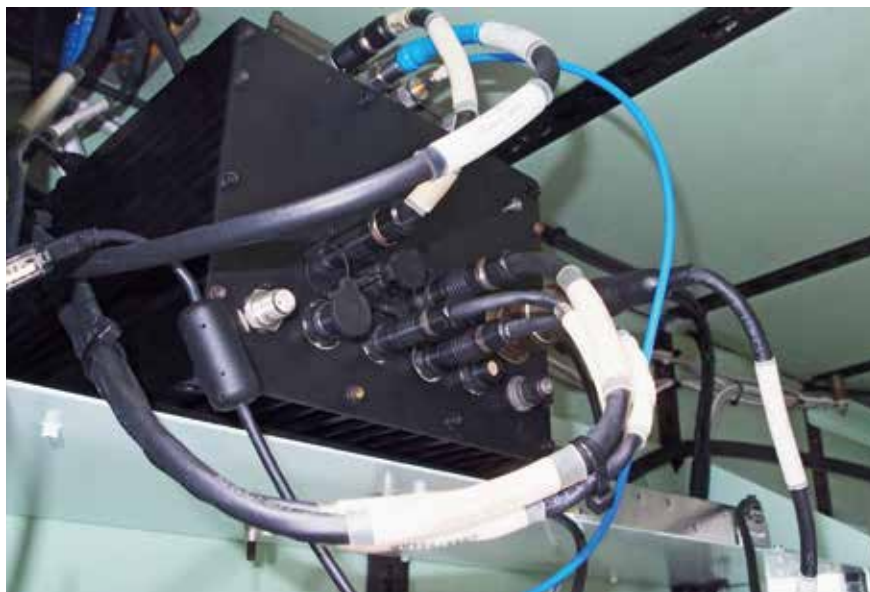


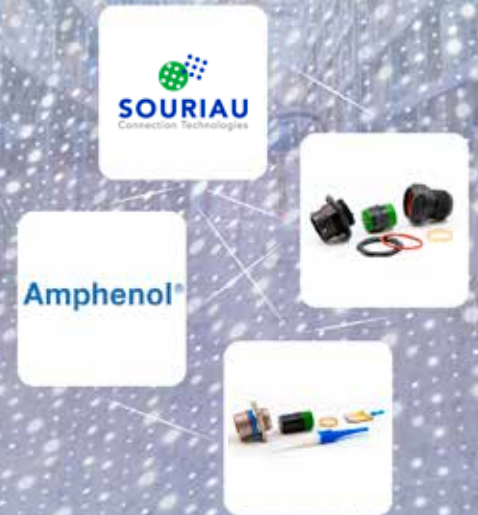
Photo: Fischer Connectors

**At Fischer Connectors, all connectors undergo extensive in-house testing for mating and cable-bend cycles, as well as resilience to environmental conditions.**

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Photo: Fischer Connectors



***With more electronics on the battlefield, cables and connectors are more important than ever.***

tro-magnetic interference (EMI) resistance was very poor. However, in those days, with little in the way of electronics on the battlefield, EMI was not the potential problem it is today.

With the mention of round connectors, it is worth mentioning that while they have been around over the years, the latest Series Three round connector innovations include one design that was a bayonet fitting, one that was a screw thread and a third that was a locking screw thread with an anti-vibration ratchet inside, so it could not undo itself accidentally. And, from improved EMC performance, not much else has changed in the world of round connector design.

### Standards and Tests

It's worth noting at this point that although many other standards currently exist for connectors – far too many to mention here – the most important standards for connectors relate to sealing, shock, vibra-

tion, temperature and corrosion. They are:

- MIL-STD-202;
- MIL-STD-810;
- MIL-STD-883;
- IEC 60068-2-17.

Most makers ensure that their products adhere to the appropriate standards. At Fischer Connectors, for example, all of its connectors are fully tested in line with Military and Military Environmental Standards, with specific connectors responding to a specific need in terms of ruggedness, miniaturisation, lightness, contacts density, easy and blind mating. They undergo extensive in-house testing for mating and cable-bend cycles, as well as resilience to environmental conditions, such as salt spray, water pressure, hermeticity (airtight seals) and extreme temperature. Fischer also carries out external testing through specialist companies for electromagnetic compliance of its products and data protocol compliance, such as USB3.0 or Ethernet 10gb. Once integrated into a platform, many

end users then carry out further testing on the completed devices according to their own required MIL standards.

### Raychem's Next Step

Getting back to Raychem, what the company eventually did was to sell its innovations as a 'system', telling customers they needed an end-to-end system with screening, which terminated properly to deliver a good EMI performance. It had to have a rugged jacket, together with a precise method of attaching it to the back of the connector, which is where the moulded part came into its own. The product was tested for environmental resilience to withstand temperatures from -50 to +150 degrees Celsius. However, as one type of polymer cannot be treated to meet all specs and perform in every application, one type of jacket or heat-treated tubing will not fulfil all requirements. Therefore, Raychem came up with different blends of materials and called them all 'systems', or 'system cells'. For example, the System 25, or DR-25, which remains today's extremely rugged de facto standard for use in military vehicles, is resistant to diesel, hot boils, aggressive fluids, and both low and high temperatures.

Raychem's approach was completely new and along with its inventions effectively wrote the initial specs for military cabling. Tyco International acquired Raychem in 1999 and, today, its former subsidiary, Tyco Electronics, now TE Connectivity, continues to sell original Raychem products, such as shrink tubing, wire and cable and SolderSleeve Devices under the Raychem brand name.

### Experience Drives Development

After the Falklands War, when fires on-board naval vessels revealed an unacceptable degree of toxicity from the halogenated wiring on board, Raychem responded by making a Zero Halogen (ZH) wire jacket. This product was aimed at mass transit vehicles, including ships, on which passengers and crew would need time evacuating. It was not acceptable to allow toxic fumes to kill, nor smoke to obscure an escape path. Although Halogenated chemicals cause such hazards, they are sometimes used to add performance to a wired/jacket system. As a result Raychem came up with ZH wire/tubing, System 25 and System 100, the latter being 100 per cent halogen free. However, the ZH system is not as robust

Photo: Fischer Connectors



***Soldier programmes pose the greatest cabling and connector challenges.***



Photo: Westwire

**A TE Connectivity mid-cable splice braid termination with BO series solder sleeve**



Photo: Westwire

**Mil c 38999 connector showing good harness practise of repair loops and a boot termination**



Photo: Westwire

**A Mil-c 26482 military connector with classic moulded part boot termination and dust cover**



Photo: Westwire

**Mil c 38999 connector with repair loops and boot termination (above) together with a stainless steel braid termination to a back shell (below)**



Photo: Westwire

**A Mil-c 26482 style 45-degree military connector**

as the DR-25, with only a minus 30 degrees to +105 degrees Celsius operating temperature range.

Raychem further built up its expertise with its first vehicle harnesses. These were for the UK's Challenger MBT and AS90 SP gun and were fully designed by Raychem, from wiring, tubing and moulded parts to the right connector to make sure everything fitted. The AS90 harness design was slightly different to the MBT design and was produced using a system called Rayaten. This had a much higher level of EMI resistance, the premise being that in a closed down MBT, less screening is needed in the harness cabling and connectors than in an AS90 that only rarely operates fully closed down and spends most of its time with its doors and hatches open.

Pioneering adhesives were also developed by Raychem to glue the cable assemblies, moulded parts and connectors together. Again, these had to have a minus 50 to +150 degrees Celsius temperature tolerance, although the type used for any specific customer would depend on the temperature needs of a particular application.

With all this vast and unique experience gained by Raychem, the company has spent years training harness shops/systems integrators, and military units to put its systems together properly and look after them. As the company had a great product family and did not want it being wrongly installed and, as a result, performing badly, codes of practice were introduced detailing how to prepare, install and lay out cabling systems for harnesses and other installations. All of these processes and innovations have set the benchmark for today's manufacturers who are faced with a much more connected battlefield that is heavily laden with electronics at every level. Connectors and cables of every description and the widest range of performance attributes are in operation like never before.

### A 21<sup>st</sup> Century Problem

However, in all the aforementioned processes and innovations, a level of system complexity had been reached to ensure the final product operated optimally. Yet, some experts today fear that those stringent guidelines and codes of practice are being followed less and less, chiefly for reasons of cost, but also due to a loss of product knowledge and a loss of industry understanding as to why such stringent guidelines are needed in the first

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Photo: Fisher Connectors



**Latest sensors and the need for high-speed data transfer place tough demands on connector and cable makers to ensure that products support and deliver the needs of the modern battlefield.**

Photo: Savox



**Latest soldier systems place some of the highest demands on military cabling and connectors in order to reliably gather and use information gathered by such worn equipment as helmet-mounted sensors.**

place. EMI resistance, for example, has to be exacting to counter the effects of all the electronics on today's battlefield. Harnesses need to be assembled as carefully as ever, but if, for example, copper braid is used to cover wires to improve EMC, different attenuation levels can be achieved depending on whether an optimised, unoptimised, or a double-optimised braid is used. However, this kind of detail seems to be the sort of knowledge that is steadily disappearing, largely as a result of cost-saving measures – because in this example, the more material you put into an optimised braid the more it costs

to make. It will then also need a better braid termination technique, which takes time to do, also adding to the cost. Erring on the side of the least expensive termination technology, because it is quicker and meets pricing targets, may, lead to potential problems later, which only come to light at a critical operational moment. Westwire Harnessing, which specialises in the design and manufacture of ruggedised electrical interconnect systems and high integrity harnesses, often supplies spares and conducts repairs on systems that have been in use since the early 1990s. Often, kit seen has already had repairs done that typically

fall well short of what is needed to ensure equipment continues working without any problems. It's worth noting that Raychem used to train military units, such as the UK's Royal Electrical and Mechanical Engineers (REME), in cable repair – and that is because the cable assemblies were previously designed to be repairable. The process was involved and incorporated what are known as repair loops, although this increases the costs, which, as already noted, are being cut wherever possible. However, if one considers the lifetime and lifetime costs of the platform on which a harness has been installed, an MBT for example, one of the last things purchasers consider is typically the harness; a 'bit of wire cabling and connectors' are never expected to cost much, particularly if only replacement parts are needed. So, when the specs for a major vehicle platform and its main systems are agreed and a contract signed at a particular value, few stakeholders realise how costly it can be if the harness has to be repaired, replaced, tinkered with regularly and the end user has to frequently request one or two spare parts, which will be costly. This will all add to the lifetime costs of the platform and potentially result in individual platforms being out of action all too frequently.

### Soldier System Challenges

Connectors and cabling play major roles in the various soldier system programmes ongoing around the globe. However, 'soldier-proofing' these systems and components is one of the difficulties that has to be overcome. According to Fischer Connectors, these soldier programmes pose the greatest cabling and connector challenges, bringing together all the constraints of familiar applications for connectors and cables, such as inside AFVs and on board drones. Yet, unlike those two scenarios where the environment is well known and defined, for soldier systems every environmental extreme has to be considered. For instance, navy seals might be dropped from an airplane at high altitude where the temperature is sub-zero, then five minutes later they might be underwater, or in a desert with extremely high temperatures. Companies like Fischer, Glenair, Amphenol and others have been involved in developing products for soldier system requirements. At one stage, connector and cable designs that would fit with the concept of hiding all the wiring inside a soldier's load carriage system, were developed, including embedded connectors. This concept, however, is being reconsidered by some programmes and the results of efforts may not be used.

## High Reliability Connector Assembly

Heilind Electronics has been serving this market since the 1970s, with the necessary expertise to be able to support customers in all technical and procurement matters and to find the right solutions. Knowing and complying with numerous norms and standards is an essential basis for a relationship based on trust, and in the MIL/AERO sector, Heilind has their own high reliability connector assembly and cable manufacture. This means that they can offer specific solutions, flexible production and very close collaboration with their customers. All products are manufactured to the highest quality standards and covered by the relevant certifications. The company specialises in: own connector assembly under license; technical consultancy and design-in services; efficient and fast order processing; kitting and special packaging. Due to own resources the standard lead time is two days, with potentially 48 hour turnaround time.



Photo: Heilind Electronics



However, these companies are still introducing latest products suited to the individual soldier systems, such as the Fischer MiniMax Series, which is a miniaturisation of the company's UltiMate series, designed to reduce both size and weight. MiniMax connectors have an extreme contact density where 24 contacts mixing power and signal fit into receptacles of 12 mm in diameter. In 2018, the company launched its Freedom Series predominantly designed for the wearable market to minimise the quantity of cables on the soldier with the first product being the LP360, designed totally with body worn applications in mind. Cables are either black or tan colour, and are reinforced with Kevlar to ensure high breaking resistance. To handle the threat of sand getting inside, the Fischer LP360's receptacle and plug are fully

sealed and sand-proofed due to the design of the contacts. The locking system is non-magnetic, further eliminating the potential for attracting sand and dust particles. The company is adamant that not even a single grain of sand can affect the performance of this connector.

Also, the soldier space, Glenair has launched its Snap-Lock, Trigger-Release Series 860 Ultra low-profile MOUSEBUD connectors. These are lightweight, shielded and designed for use on individual soldier V receptacle connectors meet MIL-STD-810G requirements for reliable performance in hostile environments and the associated overmolded MOUSEBUD cordsets for use with the connectors display excellent bending performance at temperatures as low as minus 55 degrees Celsius.

## Latest Soldier System Footnote

It is understood that being considered at present in NATO with players like ODU, Fischer and Glenair all involved, is agreement on a standard for small round circular connectors, products that all these players have in their portfolios. There is, however, no current standard for such connectors for soldier-worn equipment and none of the solutions offered by the connector makers intermates with one another. This is potentially a big interoperability issue for the Alliance. As a result, a new NATO STANAG 4695 has been issued, which requires a six-pin connector to be chosen as the interoperable connector for power and one that is based on a Glenair Mighty Mouse. So far, Glenair and Tyco Electronics have had their connectors accepted by the DoD for use on soldier programmes because they have been tested by the DoD and found to be intermatable. The Series 804 Push-Pull Mighty Mouse Six-Pin Receptacle Connector with the Tyco Electronics OCH Micro-circular connector. Meanwhile, Amphenol and ITT have also come up with their own design, although these have not been tested by the DoD for intermatability. It is understood, however, that they are intermatable. Curiously, despite not having been DoD tested, it appears that the European Defence Association has stated the likelihood it will select the Amphenol and ITT connectors as the preferred connectors for all European soldier systems. That is not to say they have yet been adopted, but this seems to be the intention, driven by Rheinmetall Germany, prime contractor for the Gladius 2.0 programme. ■



Photo: Savox

**For connectors and cables connecting mounted troops inside an AFV, issues of EMC must be considered and materials and construct must ensure no such interference takes place.**

**Acknowledgements:** Appreciation to Westwire and Fischer Connectors for their feedback during the writing of this article.

# FNH UK: New Technologies and Capabilities in the UK, for the UK



**ESD met with FNH UK during the 2019 Dismounted Close Combat Exhibition, Demonstration and Seminar at Shrivenham (part of Cranfield University), England, leading to this interview with Glyn Bottomley, CEO of FNH UK. Belgium-based Herstal Group is a world leader in Defence/Security – the FN Herstal brand – and Hunting & Sports Shooting – the Browning and Winchester brands.**



**ESD:** Historically, FN Herstal has had a low profile in the UK. Do you agree with this statement and what is the company doing about it?

**Bottomley:** Well, historically FNH has had a strong position in the UK in regard to being a weapons supplier to the UK, but FN has indeed to reinforce its

**ESD:** The majority of your activities as far as FNH UK is concerned are aimed at the UK market. Do you do also export?

**Bottomley:** We have an established export market. At the moment the majority of our activity is export, including supplying inter-company in full synergy with FN Herstal headquarters in Belgium. Also, FNH UK is the only manufacturer of complete machine guns (both HMG and GPMG) left in the UK; we continue to support the UK MoD in terms of all our Heavy Machine Guns

**ESD:** FN Herstal is globally recognised as a manufacturer of small arms. What else does FNH UK bring to the table?

**Bottomley:** The Herstal Group, the parent company of FN Herstal, has a wonderful 130 year heritage, and of course the foundation of the business continues to be as the premier weapons manufacturer; but as the business has evolved over the last decade or so it is very focussed on Systems activities in all aspects relating to weapons. The aim now is for FNH UK to promote and bring the vast array of weapon systems, technology and innovation that the group has to offer, and to be able to promote that to the UK to fulfil some of the UK MoD's requirements. I think probably the UK MoD has not had complete visibility of the full range of Herstal Group products - which also includes the 'Browning' and 'Winchester' brands and an ammunition manufacturing facility in Belgium. The job now is to elevate the business "FNH UK" to a level where the MoD have access to these products and can see them and understand what we're offering, and the large amount of R&D funding that is going into designing and developing innovative products such as weapon systems or new small-calibre cartridges. Some examples of those other activities of FN Herstal were displayed at the Dismounted Close Combat Symposium in Shrivenham, which included the Fire Control Unit for the 40mm grenade launcher, the 40mm grenade launcher itself, FN Expert (marksmanship trainer) and less lethal ideas as well. The marksmanship training system, FN EXPERT, is currently being demonstrated to the UK MoD to meet some of their lower end training needs. Soon we'll be able to demonstrate some of the technologies that will enhance that sys-



Photos: FNH UK

position for the wider range of Systems products that the Group has to offer. One of the strategic aims of FN Herstal acquiring Manroy Engineering in 2014 was precisely to establish a UK foothold that FN Herstal could use as a basis to promote the wider range of FN capabilities and products to UK MoD. As part of this plan, FN Herstal has been investing significantly into FNH UK since the acquisition to vastly increase the capability of FNH UK, which has been successful to date, and now we've got to move it forward to a new level.

(HMG), providing contractual spares, support and technical advice and the weapons themselves. We're the sole supplier to UK MoD and have been since 1988, providing about 3,000 HMGs to date. We continue to supply all the spares and training and support that the UK MoD needs to keep the weapon in service. So as stated, our overall aim is to increase our business within the UK by investing to be in a position to provide our full range of System products, beyond just machine guns, and the expertise to support integration, whilst also developing new technologies to support customer needs.



tem, using Virtual Reality technology. The Less Lethal systems we provide are being offered to UK police and law enforcement and on into UK MoD programmes. The 40 mm grenade Launcher Fire Control Unit has been sold for export: it's a well-established product, and now we're promoting it into the UK as well. So, along with all the sea, land and air systems - including Remote Weapon Stations - FN has a very wide range of products that can fulfil a lot of weapon system requirements.

**ESD:** You mentioned FN Herstal's R&D investment. How will that affect FNH UK's operation?

**Bottomley:** It will in a number of ways. In recent years FN Herstal has invested a high percentage of their revenue into R&D - tens of millions of Euros every year - to expand its range of products and services, and meet challenging market demands and requirements, today and in the future. The design teams at FNH UK are used to support the "central" R&D, so we do some of the R&D in the UK in cooperation with FNHerstal. That also gives us access to pre-production products that can be tested, evaluated and demonstrated in the UK, within reason. Plus for our UK business

to be involved in a culture of innovation and research and development of new products is very positive.

**ESD:** In terms of its overall output FN Herstal, or FN as a group, has roughly a 50:50 balance between military and police, and the civil markets. At the moment there could be said to be a window of opportunity between now and the end of this year in terms of the military market and the UK's new Defence Fund. How do you expect to respond to that from an FNH UK perspective?

**Bottomley:** This is an exciting and interesting period in the UK, and the latest information presented at the Dismounted Close Combat symposium showed in detail the UK's establishment of budgets and programmes to deliver Transformation. The budgets for the next 10 years, particularly for Dismounted Close Combat, are an area we're already involved in as a small arms supplier. Our job now is to promote ourselves, to build some awareness to let the programmers know about the products and innovations we can bring to the party.



We want to be involved as FNH UK in our own right, not only to deliver a new level of products but also to establish a new level of customer support in the UK, for the UK. We're also comfortable exploring opportunities through partnering, mergers or acquisitions, and part of that is changing perceptions regarding our own business. This is a strategy we are planning right now, and we're looking at investing in FNH UK's capability and infrastructure to increase our profile, professionalism and the customer support that we can offer to the UK.

**ESD:** Thank you.

**The Interview was conducted by Stephen Barnard.**

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# Polish Defence Industry

**Eugene Kogan**

**Compared with state-owned PGZ Group, the Polish WB Group is one of the largest private defence companies in the European defence sector. PGZ is domestic-based and ready for co-operation with the EU and the US, whereas WB Group already expanded its operations beyond the Atlantic and opened a subsidiary, WB America, in Alexandria, VA in May 2018.**

The WB Group said at the time that the offer of the new company would be shaped to reach US markets as well as the global market through the Foreign Military Sales procedure, with a particular emphasis placed on the requirements that could potentially emerge in case of Special Operation Forces. The last section of this article focuses on the Polish defence co-operation under the umbrella of the EU and the de-

has some 17,500 employees and revenues of PLN5.5Bn (about US\$2Bn) in 2018. The audited net profit recorded by PGZ Group in 2018 was PLN 37.5M.

In 2017, PGZ exported PLN798M (US\$228M), a figure that represented a 43% increase in deliveries, up from PLN560M in 2016. This increase in PGZ's sales is linked to many projects run by the Polish Government to modernise its military.

President of the Management Board, said back then that "the acquisition was a step towards Poland regaining control over its aviation industry once again, and is in line with a plan to reindustrialise the economy by taking control of Polish capital in line with the country's Strategy for Responsible Development. It will also facilitate PGZ to support the needs of the Polish armed forces with spare parts and the servicing of aircraft over coming decades, and expanding the control of PGZ with the various elements of the Rzeszow site will allow it to simplify and control the business lines, including the modernisation of production and technology." In an e-mail to the author, Justyna Moson, PGZ Communication and Marketing Department Director, noted that despite the Lol, "the WSK PZL has not yet been reacquired but PGZ is committed to this acquisition and is progressing with obtaining permissions from supervisory authorities and internal approvals from the company shareholders."

In December 2018, it was reported that the Polish Armed Forces has ordered 40 Orlik PGZ-19R tactical short-range unmanned aerial vehicles (UAV) for a range of support operations. The deal, announced by the Ministry of National Defence (MoND) on 30 November, is valued at some PLN789,7M (US\$209M) and includes options for 20 Orlik UAVs. The first UAV and simulators are to be delivered by a consortium led by PGZ, involving Bydgoszcz-based WZL-2 facility and the Warsaw-based PIT-Radwar company, members of PGZ, in 2021.



Photo: Kubson 94

**The office building of the state-owned PGZ Group, Poland's largest armaments producer, in Radom, Poland**

fence industrial co-operation between the US and Poland. Both forms of co-operations underline the interest of the Polish defence industry to share its expertise with European partners and to learn new skills from its US partners.

## PGZ Group and its Members

In 2019, PGZ consists of 63 companies and holds shares in 40 additional industries: defence, shipyard and new technologies. It

The overall budget spending increased and favouring locally made equipment helped to gain a larger market share in Poland. In 2018, PGZ exported PLN730M, close to the mark set in 2017.

In September 2018, PGZ decided to reacquire the Rzeszow-based Wytownia Sprzetu Komunikacyjnego (WSK PZL) aviation company from Pratt & Whitney (P&W), a subsidiary of United Technologies Corporation (UTC). As a result, PGZ has signed a Letter of Intent (LoI). Jakub Skiba, PGZ

## Huta Stalowa Wola (HSW) SA

One member of the PGZ Group that deserves particular attention is the HSW SA that employs around 760 workers. In 2017, HSW earned PLN570M in income and PLN14M in profit. Bartłomiej Zajac, President of the Management Board at the HSW SA, said in February 2019 "Until the moment when full and official financial results summary for 2018 is published, we may only

speak of certain estimations and assumptions. Nevertheless, we could mention an unprecedented income of about PLN700M and about PLN37M of profit in 2018. The results show that HSW, as of today, is in a good financial shape. We are one of the PGZ companies that can be ranked at the top.”

The success of HSW is linked to the restructuring of the company and investments in infrastructure since 2016. For instance, over the summer of 2018, the company invested more than PLN50M in infrastructure. A new hall has been erected with an automated welding line and installation of the milling machine to manufacture the tracked platforms for the KRAB self-propelled howitzers (SPH) that has been completed in July 2019 at a cost of PLN13.5M. HSW emphasises the fact that the investment is to accelerate and enhance the manufacturing process of the KRAB SPH and RAK 120mm self-propelled mortar system. Beside HSW, WB Electronics (a member of the WB Group) is involved in the KRAB manufacture. The TOPAZ artillery command and fire-control system made by WB Electronic controls the turret, gun layer computer and other subsystems. Zajac said “Manufacture

of both systems is the bloodstream of the company as a whole.” In the future, the new facilities will allow manufacture hulls for other HSW products, including the new generation of BORSUK amphibious IFV. Therefore, it can be said without exaggeration that HSW SA has gained a ‘lions share’ in the success of PGZ.

During the MSPO Kielce 2018, HSW showcased its NPBWP BORSUK platform. The amphibious IFV and its development are being co-financed by the Warsaw-based National Centre for Research and Development (NCRD). This project is being worked out under the guidance of the NCRD and not the MoND. Zajac said “the NCRD provides less than PLN100M. The matter that the project is not pursued under the aegis of the MoND has been brought up many times. We suggested that the NPBWP programme shall become a development project monitored by the MoND via the Armament Inspectorate. It is a serious undertaking. It bears a significant meaning for safety of the soldiers and for the combat capabilities of our armed forces.” Despite his suggestion to change the status of the programme Moson has informed the author that “no change has occurred, but

the programme is listed as one of sixteen priorities in the new Technical Modernisation Programme for 2019-26 and HSW is working on a BORSUK prototype.”

The company is also involved in an advanced Research and Development initiative related to the ZSSW-30 unmanned turret, which has been developed and designed in co-operation with a consortium formed with PGZ members and partners: PCO SA, KTO ROSOMAK and the WB Electronics. The system is going to be integrated on the ROSOMAK APCs and BORSUK IFVs. The lunch production of the unmanned turret is likely to begin in 2020. Zajac said “The ZSSW-30 and BORSUK IFVs are going to become the driving wheels of the company for many years to come.”

Finally, the memorandum of understanding (MoU) on co-operation between HSW and Rheinmetall Waffe Munition was signed in Warsaw in June 2019. Jowita Jajdelska, spokesperson for HSW, confirmed the fact that scope of the memorandum covers manufacturing of the 120 mm gun barrels, among other domains, including the manufacture of the breach mechanism elements and elements of the gun mount. 120 mm L44 guns are used in the Polish Leop-

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Photo: Wikipedia



**The company HSW has built a new production facility to manufacture the tracked platforms for the KRAB self-propelled howitzers.**

ard 2A4 (an upgraded to the 2PL variant) and Leopard 2A5 main battle tanks (MBTs).

### Return to the Civil Market

At the same time, Zajac said “One of the weaknesses of the Polish defence industry is the weak civil manufacturing market. HSW left this market in 2012, after selling the construction equipment business (HSW Dresssta) to the Chinese LiuGong firm (officially known as Guangxi LiuGong Machinery Corporation Limited). At the moment, while the situation the situation at the company is different, we are working towards returning to the civil market. The main goal is to diversify the income sources, currently based around military products and the budget allocated by the MoND. The establishment of this second pillar is perceived as one of the challenges that HSW faces, starting from 2019.”

### ZM Bumar-Labedy (ZMBL) SA

Another important member of the PGZ is ZMBL SA. The company is a partner of Rheinmetall Landsysteme (RLS) in the upgrading of the German-built LEOPARD 2A4 MBTs to the LEOPARD 2PL standards. Otmar Schultheis, Managing Director of Rheinmetall Defence Polska, said in June 2018 “in February 2018, a group of Polish workers from ZMBL were sent to Germany for training.” ZMBL will acquire the capacities to maintain and upgrade the MBTs to the LEOPARD 2PL standard and will become the repair and support centre with ownership rights to modernise the MBT on the Polish market. In June 2019, it was reported that PGZ, following the rule of optimising the use of its assets and meeting the requirements of the Polish military, divides its product competencies without

breaching the rule of equal treatment for the companies in the Group. As a result, the LEOPARD 2A5 tanks and powerpacks for the LEOPARD 2A4/2PL and 2A5 MBTs are placed within the expertise of the Poznan-based WZM SA facility. Meanwhile, ZMBL SA facility is responsible for the LEOPARD 2A4/2PL MBTs.

### OBRUM Gliwice (Research and Development Centre of Mechanical Appliances)

Besides ZMBL, an additional member of PGZ in the armoured business is OBRUM Gliwice. The plant specialises mainly in the manufacturing of engineering equipment, as well as research and development work of mechanized and armoured equipment. A consortium of Polish companies led by OBRUM acts as the contractor for development of the GEPARD [Cheetah] Close Support Vehicle that is financially supported by the NCRD. The current GEPARD-related operational concept is not yet known. However, it is known that the work should be completed by 2024.

Two additional state defence institutions need to be mentioned here: the WITU (Military Institute of Armament Technology) in Zielonka and WITPiS (Military Institute of Armoured and Automotive Technology) in Sulejowek.

### Military Institute of Armament Technology (WITU)

The Military Institute of Armament Technology, supervised by the Armament Inspectorate of the MoND, is responsible for Research and Development of new technologies for use by the military. The institute designed the KRAB SPH that is manufactured by HSW SA. Zajac said “In the area of IED/mine protection we are working closely together with WITU and WITPiS. We are jointly creating an invaluable body of know-how and experience. Never before has the Polish industry been working on IED/mines protection for tracked and amphibious platforms.” Whether this new line of business will be further pursued by HSW or not is not known to the author.

### Military Institute of Armoured and Automotive Technology (WITPiS)

The Military Institute of Armoured and Automotive Technology operates under the aegis of the MoND. It offers testing, development and manufacture services for military vehicles, military vehicle equipment and armoured equipment.

Photo: Wikipedia



**A prototype of a BORSUK IFV manufactured by HSW**

Schultheis said in June 2018: “The first (upgraded) LEOPARD 2PL has passed all of Rheinmetall’s factory tests in Germany. Now it is to be transported to WITPIS for additional qualifications.” No further information about the date of the LEOPARD 2PL transport to WITPIS was published and there is no information whether they conduct factory tests.

It can be said that PGZ Group includes the crème de la crème of the Polish defence industry. They engage in the manufacturing of mortars, SPHs and IFVs and in case of ZMBL, in the upgrade of the German-built LEOPARD tank. Three additional research facilities provide a necessary expertise in the field of Research and Development and, in case of WITPIS, offering testing facilities. Therefore, Poland managed to preserve, maintain, and expand its defence industrial infrastructure in the field of artillery and armour.

## WB Group

The WB Group contributes in the military aviation field that was partially taken over by France (formerly EADS, known today as Airbus Industries), (Leonardo), and US (Sikorsky/Lockheed Martin) in the early 2000s.

WB Group currently employs more than 800 people, more than a half of whom are engineers and R&D staff. It is known for its products such as FlyEye UAVs and WARMATE loitering munitions. The FlyEye is a proven system that has been field tested around the world and used operationally by the Polish Artillery and Special Operation Forces and the Ukrainian Military. The Armament Inspectorate of the MoND signed an agreement in December 2018 with the WB Electronics to procure three modernised sets of FlyEye UAV for the Polish Territorial Defence Component. The agreement also covers optional procurement of another nine sets of FlyEye UAV.

Poland and Ukraine also procured the WARMATE system. For instance, in November 2017, MoND signed an agreement to purchase 1000 WARMATE loitering munition systems. In addition, Polish Territorial Defence Component procured WARMATE systems, which can be used for reconnaissance, to destroy targets in a guided mode, to independently detect and attack targets in an autonomous mode or combined with FlyEye UAVs to operate in swarms. Another known system is the FONET Internal communications system, which has been integrated onto the US Army Stryker and joint light tactical vehicles (JTLV) and TOPAZ artil-

lery command and fire-control system integrated into KRAB.

In addition to WB Electronics, in 2010, the WB Group acquired communications specialist Radmor, removing it from government ownership. Although the author contacted Tomasz Badowski, the WB Group Communications and Promotion Department Director, no financial details of the company were made available.

The section below shows that despite PGZ Group focus on domestic procure-

waters. The project is one of several EU undertakings implemented within the framework of Permanent Structured Co-operation (PESCO). This initiative is also going to concern maritime routes and the so-called choke points – straits and channels. All of this is aimed at ensuring security for marine traffic and structures. The system would be making use of sensors, surface, submersible and air platforms, coupled with a special purpose software suite. The target solution is going to be



Photo: Wikipedia

***WARMATE loitering munitions produced by WB Group have been procured by Poland and Ukraine.***

ment orders, some members of the group are also open for the EU and US-Polish co-operation.

## EU Co-operation

In January 2018, PGZ and OBR CTM SA (Research and Development Centre of Maritime Technology) in Gdynia joined 40 European companies lead by Leonardo in the OCEAN 2020 programme. OCEAN 2020 is the first pan-European military research project financed by the European Defence Fund. The objective of the programme is to test unmanned aerial, surface, and submersible platforms coupled with naval situation monitoring systems that are already used within EU maritime borders.

In April 2019, OBR CTM SA also became involved in the lead by Italy European Harbour & Maritime Surveillance and Protection (HARMSPRO) project to create a system that would facilitate monitoring and protection of harbour and coastal

developed in stationary and portable variants and will be designed for monitoring harbours, anchorages and coastal waters.

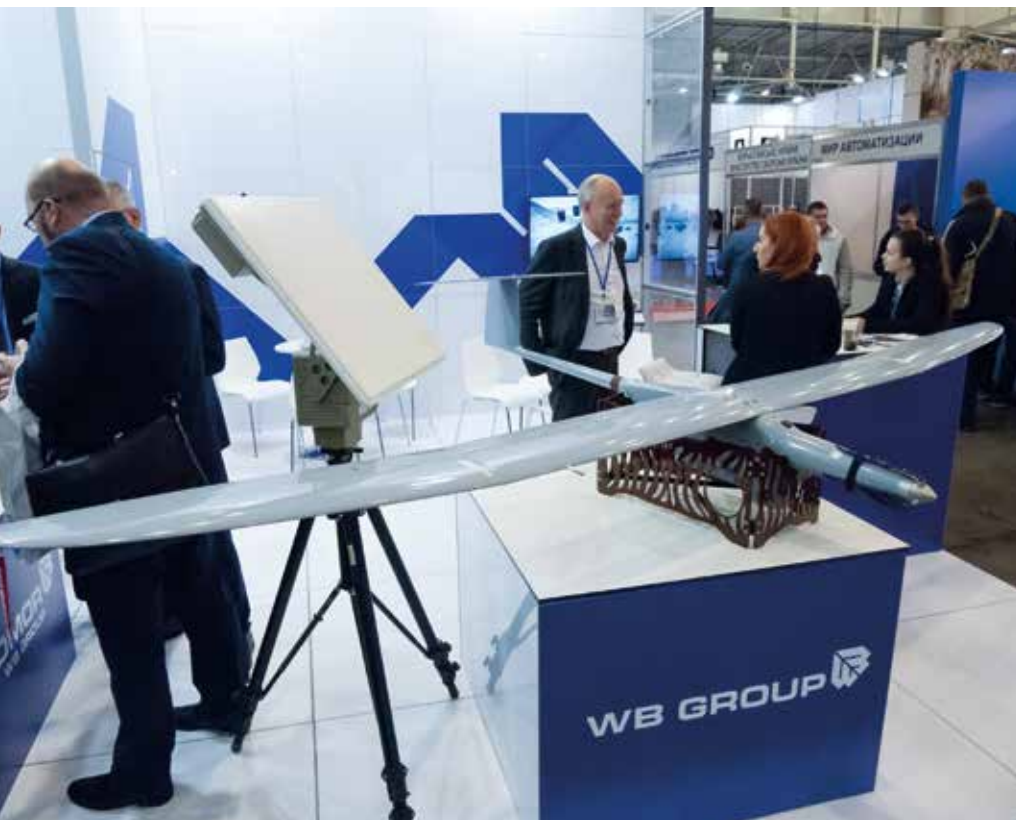
## US-Polish Co-operation

Gene Cunningham, Vice-President, Global Sales for Boeing Defence, Space & Security, said in September 2018 “PGZ is our principal defence industrial co-operation partner. The Lol validates our long-term commitment to working with Polish industry, while demonstrating industrial co-operation that supports Poland’s national security goals of developing independent defence capabilities.” Jakub Skiba, President of the PGZ Management Board, described the signature of Lol as “Another step aimed at building a service and modernisation base for the combat helicopter that might be selected in the Kruk programme.” Under the agreement, Boeing and PGZ will explore opportunities to support, sustain and upgrade equipment and

integrate unique Polish systems onto the AH-64E APACHE helicopter. It also seeks to incorporate PGZ companies into the US manufacturer's supply chain and strengthen their manufacturing capabilities. Other likely contenders for the Kruk requirement include the Airbus Helicopters TIGER, Bell AH-1Z and Turkish Aerospace T129. In January 2019, it was reported that

Swidnik plant, owned by Leonardo, as well as scientific and industrial facilities. In March 2019, HSW SA and Raytheon IDS signed a MoU that makes it possible to prepare manufacturing and integration of 16 M903 launchers – the basic building block for the WISLA air-defence system. The agreement is perceived by PGZ as a 'milestone', since HSW is con-

nents of the launchers. The batteries delivered to Poland would utilise Polish-made launchers. In PGZ's opinion the aforementioned transfer of 'know-how' would make it possible to reduce the launcher life-cycle management costs. The PGZ Group would be responsible for operational use and further upgrades of the M903 systems. The launcher in question is also going to be used by Patriot systems operated by other states, which paves the way for PGZ and HSW to get more orders.



*The FlyEye UAV developed by WB Group*

the deadline for choosing a new attack helicopter platform has been postponed and remains uncertain due to the armed forces' many requirements in terms of weapons modernisation. It currently appears that a purchase could take place, at the earliest sometime before 2025.

Due to uncertainties, back on the 10<sup>th</sup> of July July 2018, Leonardo and PGZ signed a Lol specifying the principles of co-operation in the design, production, final assembly, sale and after-sales support of the brand new AW249 helicopter. It was the result of Leonardo's talks with PGZ, as well as other representatives of the Polish defence industry, concerning the potential participation of Poland in the AW249 programme. Leonardo emphasises that this Lol confirms their will to share tasks not only during the production stage, but even earlier than this too. Poland is an attractive partner for the Italians – it is just about to invest in the above-mentioned combat helicopters programme. In addition, there is the PZL

cluding a contract with Raytheon, covering the process for the integration and manufacture of 16 Patriot system missile launchers. All of that is to happen within the scope of Phase One of the Polish WISLA Air-Defence Programme. It was in October 2018 when a request was placed by Raytheon with HSW SA, with regards to this agreement – one of many business agreements related to the WISLA system.

The representative of the Raytheon also stated that the agreement signed with HSW is the first of the manufacturing contracts that is to be awarded to the PGZ Group, within the framework of the effort related to Phase One One of the WISLA programme.

PGZ claims that, over the course of Phase One, HSW and others of the Group's companies would be obtaining technologies and 'know-how' that would consequently enable them to manufacture launchers and compo-

## Conclusion

The scope of work of the defence industry domestically and internationally is indeed very impressive. The Polish defence industry has retained the necessary skills and 'know-how' for manufacturing military products for the armed forces and it appears that the industry will be engaged in domestic production for the next decade or so. Despite selling off Polish military aviation plants in early 2000s, the creation of the WB Group in 1997, the recent intention of PGZ to re-acquire WSK PZL and PGZ lead ORLIK UAV programme shows that not everything in the domestic military aviation scene has been lost. Polish defence co-operation under the EU umbrella and the US-Polish bilateral defence co-operation demonstrates the Polish defence industry's interest to open up, contribute its knowledge and know-how to European partner programmes, and and also acquire the necessary skills from the US. Both forms of co-operations are for the medium to long-term and are likely to benefit the Polish defence industry in the long run.

PGZ Group financial results – including an impressive result of the HSW in particular – demonstrates the Group's robustness and trend to maintain healthy financial shape and investment into Research and Development. The latter is of crucial importance for Poland's domestic needs and arms exports. Co-operation between PGZ and WB Group emphasises their mutual interest in pursuing joint projects and securing funds from the MoND for the next decade. WB Group expansion beyond the Atlantic shows that leaders of the group understand that turning WB into an international company requires having a 'foot on the ground' in the US and from there pitch its products to the nearby countries. ■

**The author would like to thank Justyna Moson, PGZ Communication and Marketing Department Director, for assistance in the preparation of this article.**

# MSM / ZVS: a 500% Increase in Under Five Years



Photo: MSM Group

To mark both MSPO and DSEi in 2019, ESD interviewed Marian Goga, CEO of ZVS Holdings a.s.



**ESD:** Please explain the relationship / structure between MSM, ZVS and their position with reference to the Slovakian MOD and international customers.

**Goga:** MSM Group is a mother company (holding) of multiple defence production plants. MSM Group preserves the history of the daughter companies and does not change their names or their branding. ZVS was an ammunition plant established in 1937 and MSM acquired those shares in 2015. The outstanding 50% remain in the portfolio of the Slovakian MoD, through the state-owned holding company, DMD Holding. However, MSM Group fully controls the management rights, strategy and direction of the company: unlike any other company within MSM Group, ZVS has its own management, marketing and sales and only coordinates their activities with MSM Group. ZVS was a strategic defence company fully owned by the Slovakian MoD until 2004, but the challenging financial situation obliged the MoD to sell 50% of the shares to private investors, while also giving up its management rights. ZVS is still considered to be a strategic producer for the MoD when the geopolitical situation becomes difficult, but demand for ZVS products from the MoD has been very limited in the last year due to heavy investment in 8x8 vehicles, 3D radars, fighter jets and so on. In 2017 only 2% of ZVS's turnover was related to supplies to our own MoD; in 2018 it was around 8%; and the projection for 2019 sees it going down to 2% again.

**ESD:** With its latest 155mm ammunition the company has achieved some key technological advances: please explain some of them, and how they impact your customers domestically, within Europe / NATO and abroad.

**Goga:** In recent years ZVS shifted its focus towards NATO ammunition. Our main focus remains 155mm ammunition, but we are working on adding other ammunition types into our portfolio – such as 105mm artillery, 105mm tank and 120mm tank ammunition. In terms of the workforce we have a negative situation because there is currently no university in Slovakia which focusses on construction and design of ammunition, and because our older technicians – those who would be able to design such ammunition – are nearing retirement. So we are looking abroad for people and companies with whom we can cooperate on finalising the design and testing of these ammunition types. We can safely say that we will be introducing new ammunition types in 2020 and 2021. Regarding 155mm, our focus remains to provide a product which will surpass our competitors in terms of performance, while combining it with a relatively low price, especially when compared with Western Europe. So, we are trying to offer a high-end product, compatible with the latest NATO requirements, at a reasonable cost. We have successfully surpassed all of our competitors, worldwide, in multiple

tests in various countries in terms of range and dispersion, and we are still keeping the pricing below our competitors'. A minus point has been the fact that the Slovakian howitzer, ZUZANA, is only in service in two countries – Slovakia and Cyprus – and for other countries we are required to conduct compatibility test with their current in-service howitzer, even though our ammunition is produced according to all NATO re-



Photo: MSM Group

quirements and according to JBMoU. Such testing is often on a no-cost /no-obligation basis and is relatively expensive. We have never encountered a howitzer for which our ammunition is non-compliant and we have always surpassed the results of current in-service ammunition in these particular countries. That means we have to carefully select the markets where we will focus. ZVS is also heavily investing in production technology which has not been modernized in almost 40 years. Outside of that we are working with several renowned companies around the world to complement our 155mm port-

## ■ INDUSTRY & MARKETS

folio with various fuses and range extension technologies that we currently don't produce in-house. Over the past four years we have hugely expanded our production rate, product variety and product performance to make ZVS the best supplier for NATO and non-NATO countries who want to buy a high-performance round.

**ESD:** Do those technological advances also apply to smaller calibre ammunition?

**Goga:** The technology is very different from artillery and tank ammunition and as small caliber ammunition production is currently very limited we try to focus 100% on larger calibres.

**ESD:** Military demand for ammunition of all types has exceeded supply for several years now. What have been the consequences for MSM/ZVS, and what about plans for the future?

**Goga:** Since MSM Group acquired half of ZVS in 2015, sales have increased by about 500%. There are various reasons for that. First, we completely rebuilt the sales strategy, appointed new sales and marketing teams and created a vision which we are now trying to implement. Then, we have started to participate in multiple internation-

al, regional and local defence exhibitions: we have increased the number of presentations for defence not just in Europe, but also in the Middle East, Far East and Africa: we have complemented our "incomplete" product through cooperation agreements with multiple producers around Europe, and now we can offer complete 155mm ammunition solutions to our customers. The thing we noticed most was that even though ZVS had a great product, they lacked a marketing and sales strategy, and demand was mostly customers approaching ZVS rather than ZVS the other way around.

Secondly, the market situation - not just in Europe but all around the world - has changed. We are living in relatively hostile geopolitical times (the Arab Spring, Islamic state threat, Russian-Ukrainian conflict) and countries started to invest heavily in modernising their army inventories. Because 155mm systems are currently NATO's main artillery systems, a lot of countries started to shift from 100mm, 122mm and 152mm towards 155mm artillery. That's not just because they don't want to be dependent on "Soviet" systems and ammunition, but also because the Russian export of artillery systems is very limited and offers very few modernisation paths for current users. Compare the maximum 25 -

26km range of standard 152mm artillery with 155mm where you can easily achieve (for the same amount of money) 40km - and if you invest in V-LAP 155mm, or even precision-guided ammunition such as EXCALIBUR you can get 80-100km range. So, the demand for 155mm ammunition increased.

And I think the phrase "demand exceeds the supply" is a little bit overstated. Every manufacturer is fighting for new contracts in new territories, not just in 155mm but also in other calibres. In reality, all the producers try to protect their established markets and it is very difficult for other producers to penetrate them. This means that even if a country has a higher demand, due to a sole-source supplier they cannot buy more ammunition because their sole-source cannot deliver more. This creates market fluctuation: sometimes it creates "stronger" years for some companies, while it can easily mean that the same supplier who supplied ammunition worth, say US\$100M in 2019 will only deliver US\$50M the next year purely because they are dependent on particular markets and unable to penetrate new ones.

**ESD:** Thank you!

**The Interview was conducted by Stephen Barnard.**



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# New Lightweight Radars andIRST from Leonardo

Luca Peruzzi

Leonardo's new Electronics Division established in December 2018 unites all the activities and products of the three previously separated entities Land & Naval Defence Electronics, Airborne & Space Systems and Defence Systems divisions.

Leonardo's facility in Nerviano near Milan (Italy) and part of the company's Electronics Division, has further developed its GRIFO and GABBIANO radar families as well as the IRST (InfraRed Search and Tracking) products portfolio, looking to new solutions for airborne and naval applications.

Leonardo plans to begin flight trials of its new GRIFO-E lightweight multimode airborne fire control system before the end of 2019, with production standard equipment ready for delivery from the early 2020s on. Being the latest generation of the GRIFO X-band radar family, the E-version is a step change through the introduction of a gallium nitride (GaN)-based active electronically scanned array (AESA) antenna provided by its UK sister facility in Edinburgh, together with a new integrated multi-channel receiver exciter processor (REP) architecture able to exploit software-based radar modes. Leon-



Photo: Leonardo

**Leonardo plans to begin flight trials of its new GRIFO-E AESA radar before the end of 2019, with production standard equipment expected to be ready for delivery from the early 2020s.**



Photo: Luca Peruzzi

**Leonardo is proposing the GRIFO-E AESA radar for the M-346, as well as a couple of other platforms while a potential smaller antenna application is also pursued.**

ardo's Nerviano unit is taking the overall system responsibility and develops the integrated radar 'back end'. The GRIFO-E is aimed at the lightweight fighter/attack aircraft market, for either new-build or retrofit programmes but also for third- and fourth-generation combat aircraft used by private contractors for 'aggressor' training.

Leonardo has sold more than 450 examples of the mechanically scanned GRIFO radar in a number of versions. The first model, the GRIFO-F, found its launching customer in the Republic of Singapore Air Force (F-5 fleet modernisation by Elbit) followed by the Pakistan Air Force (the F-7, F-7PG and the MIRAGE III/EA fleets) and the Czech Republic Air Force for the Aero Vodochody L-159 light attack aircraft. Some of these aircraft have since been sold to the Iraqi Air Force and to flight services contractor Draken International, maintaining the Leonardo radar. The GRIFO-F/BR variant was selected in 2001 as part of

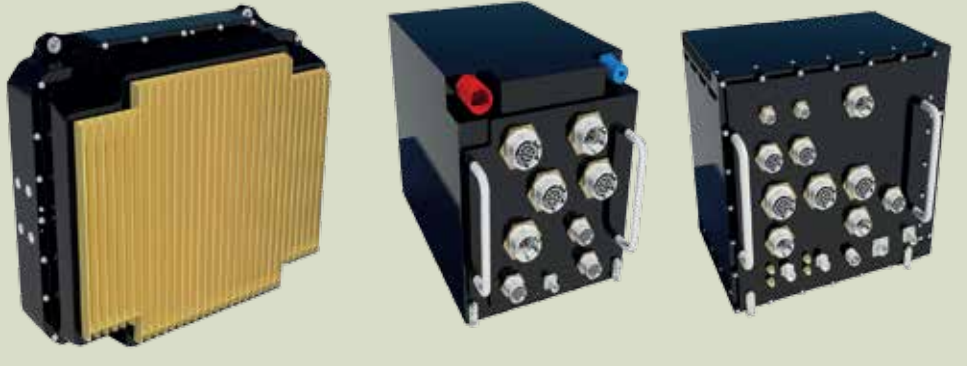


Photo: Leonardo

**The GRIFO-E's three-line replaceable units: the fixed flat plate AESA antenna, the integrated multi-channel receiver exciter processor (REP) and the power supply unit**

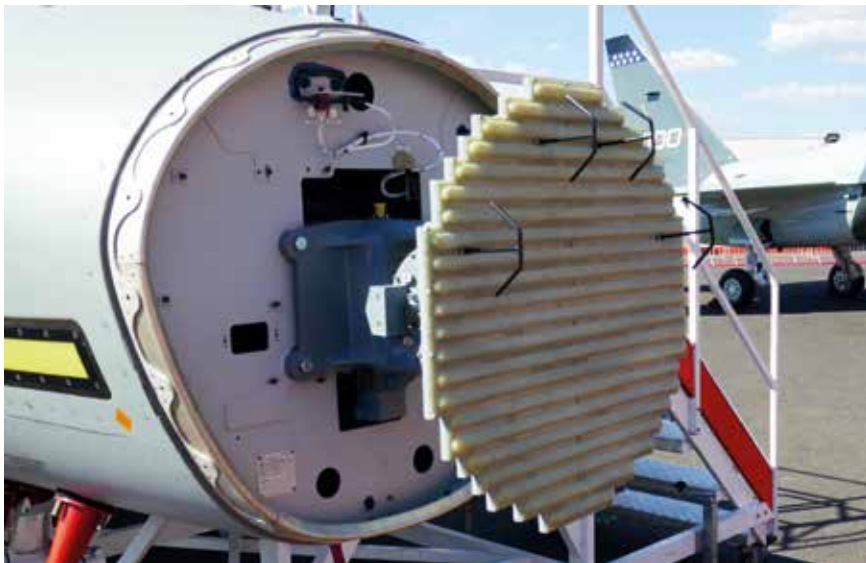
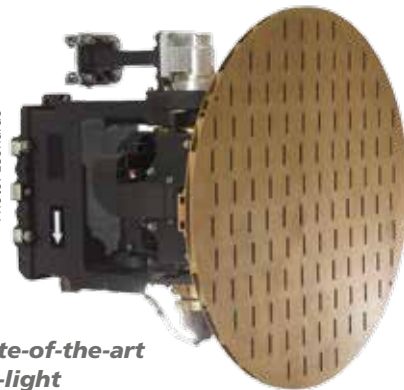


Photo: Luca Peruzzi

**Leonardo has developed the GRIFO-346 radar with a new dedicated flat-plate conventional antenna. The latter has completed development ahead of integration and flight test.**

the Brazilian Air Force's F-5BR avionics upgrade which also saw the first integration of Rafael's DERBY beyond-visual-range (BVR) air-to-air missile. In 2014, a Far Eastern customer reportedly being the Royal Thai Air Force bought the new 'intermediate wideband configuration' of GRIFO-F for its F-5 SUPER TIGER upgrade. This build standard incorporates improved mode performance, high-resolution radar capabilities, a new signal processing architecture, a wide-band receiver, and engineering changes to remove obsoles-

Photo: Leonardo



**The 12' diameter state-of-the-art antenna of the ultra-light GABBIANO radar for small unmanned platforms.**

cence and improve reliability. The company also conducted installation studies of a GRIFO-tailored version for its M-346 fighter/attack aircraft version. "The GRIFO-346 comes with a slightly larger antenna, which optimises the performance of this version," said Federico Scannapieco,

Senior Vice President Radar and Advanced Targeting. Leonardo has completed development of the dedicated flat-plate antenna ahead of integration and flight testing. "The exact schedule could be influenced by customers, but hopefully this will be in the second half of 2019", Scannapieco said.

Based on market research, Leonardo launched the development of a new processor/receiver architecture designed to interface with an AESA antenna, which finally became the GRIFO-E version. The later comprises three-line replaceable units: the integrated multi-channel REP, which is similar in size to the previous processor hardware while providing the capability to process eight parallel receive channels; a fixed flat plate AESA antenna, containing approximately 600 GaN transmit/receive modules; and the power supply unit for an overall 100 kg radar suite which is only 10% heavier than the previous version. As the AESA antenna requires liquid cooling, Leonardo offers a liquid cooling unit. "The multi-channel architecture allows having very accurate rejection of jamming interference and clutter, and a very high capability to detect small slow-moving targets".

Since Leonardo has an AESA radar capability in the UK, the Group decided to integrate an antenna unit jointly designed by Nerviano and Edinburgh (UK), which is being developed and manufactured in Edinburgh's Crewe Toll facility. The AESA antenna use of GaN-based transmit/receive modules is a new thing for Leonardo; it enables smaller platforms to exploit the advantages afforded by AESA techniques and its significantly wider bandwidth. While GRIFO-E will incorporate some new operating modes, much of the radar software is being pulled through from the existing mechanical-scan (m-scan) radar family. All existing modes of the m-scan radar were implemented and improved in the electronic scan (e-scan), taking advantage of the new architecture. The AESA offers much more flexibility to the pilot.

The GRIFO-E was formally launched at the Farnborough International Airshow

Photo: Leonardo



**The ultra-light GABBIANO multi-functional unit with a 20-watts average power solid-state transmitter of reduced dimensions (44.6x29x22 cm).**



Photo: Leonardo

**The ultra-light GABBIANO radar on the AWHERO rotary-wing platform.**

in July 2018. "We will have the first AESA antenna by July 2019, and the receiver/exciter/processor unit will be ready during the second half of the year", Scannapieco said. Integration and safety of flight verification is scheduled for the second half of 2019, enabling performance verification to start later that year.

It is expected that the completion of qualification and the start of series production will be made dependent on potential launch customers. "Leonardo is already engaged in proposals based on the M-346, as well as a couple of other platforms while we also pursue a potential smaller antenna application," said Scannapieco. The new radar has the provision to integrate a BVR missile as well as a 'repositioner' and exploit electronic attack capabilities, but as of today, Leonardo offers a fixed AESA antenna.

Leonardo estimates that 60% of the potential market for GRIFO-E is in the retrofit sector. A significant part of this is likely to come from the growing number of fast jet 'aggressor' fleets operated by contractors, which are a difficult market due to the tight delivery schedule. Leonardo is introducing a solid-state transmitter upgrade for the existing mechanically scanned GRIFO-F radar, as the e-scan version costs 50% more and needs platform modifications due to the required power and cooling. Development of the solid-state GRIFO m-scan radar is expected to be completed in 2020. "According to our roadmap, there will be only one "backend" based on the integrated architecture of the new generation and one "frontend" based on m-scan or e-scan", Scannapieco said.

## The GABBIANO Ultra-Light Radar

Market demands for radar on unmanned platforms made Leonardo develop the ultra-light version of the X-band GABBIANO family; it is based on two elements including a 12' diameter state-of-the-art antenna and a multifunctional unit with a 20-Watt average power solid-state transmitter of reduced dimensions (44.6x29x22 cm) for a total weight of 24 kg. High resolution modes (Spot SAR and Strip SAR) grant a submeter resolution while the GMTI mode allows detection of moving targets on ground and sea which, coupled with ISAR mode, allow the system to classify the observed target. The radar also features air-to-air modes and

a unique terrain avoidance mode. The ultra-light version also has extremely reduced power consumption, making it one of the few, if not the only, small and light radar system with conventional antenna on the market, Leonardo claims.

The version is designed to perform the same range of missions as larger GABBIANO versions, with very similar performance. The ultra-light version equips the Leonardo AWHERO's 205 kg maximum-weight rotary-wing platform, together with an Automatic Identification System (AIS) and EO/IR turret, as well as the same group's FALCO EVO being used by the Frontex border protection agency under a service contract for maritime surveillance. The ultra-light GABBIANO was also tested on a SKYSPOTTER UAS as well as completed feasibility integration studies on UMS SKELDAR V-200, Schiebel CAMCOPTER S-100, HERMES 90 and other unmanned platforms.

## IRSTs

Based on the PIRATE (Passive InfraRed Airborne Tracking Equipment) IRST (InfraRed Search & Tracking) experience for the Eurofighter TYPHOON within the Eurofirst consortium led by Leonardo with the participation of Thales UK and the Spanish company Tecnobit, Leonardo has developed its own SKYWARD proprietary product, which was commissioned in 2010 to equip the Saab GRIPEN E-fighter aircraft. "SKYWARD was developed to satisfy the 5th generation fighter requirements with a system operating in the long-wave (8-12 micron, or optionally mid-wave, 3-5 micron) band and a configuration including a sensor head unit (SHU) and the da-

Photo: Luca Peruzzi



**The GABBIANO radar family is used by the FALCO UAS family.**

Photo: Leonardo



**The EuroFirst consortium led by Leonardo, and including Thales UK and the Spanish TecnoBit has produced more than 500 PIRATE IRST.**

ta processing unit for a total weight of 40 kg”, said Leonardo’s VP IRST Programmes Giorgio Balzarotti. SKYWARD-G can detect and track hostile targets, including aircraft, ships and vehicles; it also features a counter stealth capability which allows detecting and tracking very-low radar signature targets both

and 60 degrees on the horizon and vertical planes, the SKYWARD-G has a series of operating air-to-air, air-to-surface, air-to-sea and landing aid modes, with tracking while searching capabilities of up to 200 targets simultaneously. So far, 150 systems in different versions have been ordered. In 2016, SKYWARD in the K-model, of which no details are known, was selected for a fighter platform programme under development by a customer from the Far East. First deliveries are expected in 2020. ESD believes that this is the new generation KF-X fighter programme for South Korea. In addition to being offered in a pod-mounted version (SKYWARD-F) selected in 2012 by Northrop Grumman to equip its OpenPOD product being offered to US customers, SKYWARD was more recently selected to equip an unmanned surveillance platform of a Far East country. “Called SKYWARD BA, the latter has been integrated on board a UAV tactical platform which is at the end of its development phase, in two units to be delivered in 2019”, Balzarotti said. The pod-mounted installation pushes towards air-to-ground as well as air-to-air operations, but Leonardo did not comment. SKYWARD BA could also equip GA-ASI’s MQ-8B SKY GUARDIAN UAV. Leonardo has also gained experience in the Unmanned Combat Air Vehicles (UCAV) sector participating to the European nEuRON programme with the responsibility for the Smart Integrated Weapon Bay (SIWB). The latter provides autonomous detection, identification and tracking of ground fixed and mobile targets. The airborne segment of the SIWB

includes the Mission Controller (MC), the Electro Optical Processor (EOP) and the Integrated Optronic Head (IOH) in addition to the weapon bay management system. The IOH includes a 3-5-micron IRST sensor with laser rangefinder and a controlling unit with automatic target recognition algorithms, thanks to which targets are identified through comparison with an on-board stored images database loaded before mission.

## MAIR

Leonardo’s business unit in Nerviano is developing a new-generation infrared situational awareness and attack warning system called MAIR (multi-aperture infra-red), consisting of a multiple distributed camera system operating in the IR spectrum and able to automatically detect and track air vehicle and missiles and to provide day/night spherical imaging for situational awareness. “The MAIR has a dual main mission: provide not only multiple simultaneous missile launch warning but also the required accuracy for directional countermeasures (DIRCM) engagement in addition to hostile gun fire indication, as well as day/night situational awareness in degraded weather or operational conditions”, said Leonardo’s VP IRST Programmes Giorgio Balzarotti. The company only acknowledged to have conducted an extensive campaign with its own hyperspectral system against a range of targets to better determinate the most effective operating-band. The system prototype was expected to complete ground trials in 2018 in preparation for flying on test-bed platforms in early 2019. The latter include a small general aviation aircraft and a commercial helicopter. “The final MAIR suite for rotary-wing applications is expected to include up to 5-6 heads depending on spherical coverage requirements, each weighting about 2.5 kg with one operating as master/interfacing unit with the on-board mission system. A control unit is added if video coverage is required”. Each sensor head will also include a laser warning aperture capability, the Leonardo representative said. In addition to rotary-wing applications, MAIR has been conceived and developed for both transport and combat aircraft, in the latter case exploiting all the processing experience developed with fast-jet IRST to provide a spherical situational awareness. Even if the programme has attracted strong interest, MAIR is being developed with company funding. ■

Photo: Leonardo



**The Leonardo SKYWARD family of IRST for both combat manned aircraft and unmanned platforms**

alone and together with other on-board passive sensors in a fully integrated way. The system is able to detect the aerodynamics heating of the aircraft surfaces and engines absorbed by the same external structure, while flying at subsonic speeds. With a search sector of respectively 160

# “We believe in the unmanned turret as the ultimate solution for combat vehicles.”



Photos: RAFAEL

**Prior to his assignment at RAFAEL, Maj Gen (ret'd.) Yoav Har-Even served as Head of the Israel Defence Forces Operations Directorate.**

**ESD:** What does RAFAEL's business record with the Spanish Armed Forces look like?

**Har-Even:** Rafael has a long and successful record of defence projects developed in Spain during the last 20 years. At the beginning of the 2000s, the Spanish Air Force acquired the LITENING II targeting and navigation pods and the RECCELITE reconnaissance pods for its F-18 fighters. During the last few years, LITENING III pods have been purchased for the EUROFIGHTER aircraft, and it is estimated that in the coming years the new and innovative LITENING 5 pods will be acquired as well as the RECCELITE XR. The Spanish Army, as well as the Marine Corps, have successfully been using the SPIKE LR missile for more than 10 years, while for a similar time, the SPIKE ER missile is the main weapon of the TIGER attack helicopters. The Spanish Navy has successfully operated the MK-38 naval RCWS with a 25 mm calibre cannon for more than a decade in different ships of its fleet. The programmes carried out by RAFAEL in Spain have had an important content of industrial co-operation with a high added-value of transfer of important technologies, such as the transferred capacities

**At the recent FEINDEF exhibition in Madrid, Spain, RAFAEL drew attention to a selection of dedicated capabilities and products.**

**On this occasion, ESD had the opportunity to speak to Maj Gen (ret'd.) Yoav Har-Even, RAFAEL's President and CEO.**

in the area of electro-optics that served as one of the main pillars that allowed the Spanish company TecnoBit to become a national and international benchmark in the area of electro-optical systems. RAFAEL has proven to be a reliable industrial partner and provides high technological added-value in every programme that has developed in Spain.

**ESD:** You mentioned the SPIKE missile system which, among others, is in use with the Spanish TIGER combat helicopter fleet. On a global scale, in how many countries is the missile in service, in what versions and for what applications? How many versions are there in total?

**Har-Even:** The SPIKE missile family of multi-purpose, multi-platform precision weapon systems has been operational and combat-proven for almost four decades. The SPIKE missile is an 'off-the-shelf' 5<sup>th</sup> generation precision guided missile, which includes an electro-optical seeker and a bi-directional data link, enabling ultra high accuracy and enhanced lethality. Today, the family is in use with 33 armies, navies, air forces and special forces around the world, with more than 5,500 missiles fired in training and combat. SPIKE is offered in different applications (shoulder-launched, tripod, vehicle, vehicle-towed launcher, helicopter). The SPIKE missiles have already accumulated a vast track record of target engagements such as enemy tanks,

armoured vehicles, soft vehicles, incoming manoeuvring armoured VIEDs (Vehicle Improvised Explosive Devices), static and mobile radars, marine vessels, and enemy anti-tank/mortar squads and, of course, structural targets (such as enemy ammunition storage, enemy forward-based headquarters or enemy infrastructure).

For the combat helicopter, the main advantages of the SPIKE family include the ultra-long 30km stand-off range and Non-Line-of Sight (NLOS) attack capacities, which increases aircraft survivability dramatically (in comparison to laser-guided munitions which force the pilot to get very close to the target) and the passivity of the EO seeker, unlike the laser guided munitions, which can be detected upon lasing on the objective.

The SPIKE Family includes the following off-the-shelf products:

- SPIKE NLOS (Non Line Of Sight): 30km, 75 kg;
- SPIKE ER2 (Extended Range): 10km (ground launch), 16km (rotary launch), 34 kg;
- SPIKE LR (Long Range): 5.5km (ground launch), 6.5km (rotary launch\*), 13.4kg. An RF data link is under development, which will allow LR2 to reach 10 km in rotary launch;
- SPIKE SR (Short Range): 2,000 metres, man portable, multi-purpose electro-optical guided missile system.



**RAFAEL's SAMSON 30MM remote-controlled weapon station with SPIKE and the TROPHY active protection system**

**ESD:** What capabilities does the FIREFLY variant of the SPIKE family provide for the dismounted infantryman? Is it in service?

**Har-Even:** FIREFLY is a revolutionary, innovative miniature electro-optical tactical loitering munition, designed for light manoeuvring ground forces such as infantry, marines or special forces. As a variant of RAFAEL's SPIKE Family, the FIREFLY features a dual seeker, target tracker, homing algorithms, computer vision, safe & arm fusing mechanisms and HMI (Human-Machine Interface). These features served as a basis for the development of the FIREFLY and the tailoring of the weapon system to its unique mission profile of urban combat.

The FIREFLY weapon system kit includes three miniature LMs (Loitering Munitions) and a CU (Control Unit) based on a ruggedised tablet with a military standard bi-directional data link.

FIREFLY round weighs only 3 kg and is rapidly deployed within seconds. It is portable, durable and includes a rugged airframe withstanding the harsh environment of urban combat. Its single-user operation is designed for the dismounted soldier – light, small and agile.

The operation of FIREFLY is very intuitive, with no special skills required. FIREFLY enables overmatch to break combat deadlock, and has a lethal effect on stationary and moving targets with or without line-of-sight to operator.

FIREFLY has an abort/wave-off capability and full, safe returnability to the operator up to attack command. It can be operated day and night, and has low visual and acoustic signatures.

FIREFLY is already under contract for thousands of munitions to a first customer and planned for fielding during 2020.

**ESD:** RAFAEL is among the bidders for the 30mm turret to equip part of the future DRAGON 8x8 armoured vehicle fleet of the Spanish Army. Considering that the requirement is expected to specify both manned and unmanned turret systems, how can you respond to the need?

**Har-Even:** RAFAEL began presenting its potential solutions for this programme more than ten years ago. Some of them were so well-received that even the initial requirements were modified, in which, for example, the possibility of unmanned turrets had not been contemplated. Today, the situation is almost the opposite. The unmanned turret is a mandatory requirement in most of the 8X8 programmes worldwide, while the manned turret is questioned due to its high weight, internal space consumption and reduced protection to the crew. We believe in the unmanned turret as the ulti-

mate solution for combat vehicles, we put all our efforts in developing and producing the best unmanned turrets and this is the solution we propose for the DRAGON 8x8. The integration of missiles that are already in the Spanish inventory, which is a requirement of the programme, is an element of zero risk for us since we are developers of both systems and this kind of integration has already been done for various users of turrets. Moreover, our solution will also allow us to use new models of the SPIKE missile without requiring any modifications in the future, such as the ability to use the new SPIKE LR2 missile. Other solutions that RAFAEL presented, such as the TROPHY Active Protection System (APS), were initially considered 'desirable' and are now becoming an essential requirement. We can even supply a 30 mm unmanned turret with TROPHY and SPIKE, all integrated with the same turret by the same OEM.

**ESD:** How can the Spanish industry take advantage of your company's bid in the scope of the DRAGON programme?

**Har-Even:** In addition to developing and selling systems, RAFAEL is a company that is committed to its client and to the local industry partners, giving a substantial technological added value that stays in the country for many years after programme execution. Since RAFAEL works continuously to implement the corporate culture of creating partnerships around the world with governments and leading defence industries, it is also willing to transfer production to Spain, and we believe that this contribution is an important part in ensuring the success of any programme, and in particular the 8X8 DRAGON programme.



**SPIKE missile launched from a Sikorsky BLACK HAWK helicopter**

Besides, the greatest contribution we can offer to the DRAGÓN programme is 'peace-of-mind' to the user, both from the technical-operational point of view of the solutions we provide, as well as the successful experience of the Spanish Armed Forces in all the programmes that RAFAEL has completed in Spain during the last 20 years, proving time and again the complete fulfilment of our commitments. Several of our systems, of increased complexity, have been fully operational in Spain for many years. Some of the employees of our subsidiary in Spain have been decorated for their delivery and assistance in areas of conflict operations, and whenever they have been required, they have worked side-by-side with the Spanish troops keeping our systems permanently operational.

**ESD:** Your exhibit at FEINDEF included a display of SAMSON 'Mini'. What applications has this weapon station been designed for and what is special about it?

**Har-Even:** The SAMSON Mini dual-axis, gyro-stabilised RWS is designed for use on any wheeled or tracked combat vehicle, fast attack boats and other platforms requiring improved offensive capabilities. The system enables target engagement with enhanced accuracy, while maximising crew protection from enemy fire.

This single-weapon RWS accommodates a variety of armaments, including a 5.56mm SAW and LMG, 7.62 mm GPMG and GATLING gun, 12.7 mm HMG, 14.5 mm, 40 mm AGL, ATGM launcher, ASM, fed by high-capacity magazines. Supported by a ballistics-protected multi-sensor sight pod, with an optional mechanism for super elevation ballistic angle calculations, SAMSON Mini provides a 'round-the-clock' response to high-maneuvring battlefield challenges.

The system is mature and in service with more than 11 NATO countries and many other users around the world.

**ESD:** On a global scale, we are observing increased efforts towards digitisation programmes for military forces. Against this background, what contributions can RAFAEL make to support these efforts?

**Har-Even:** There are numerous international digitisation programmes requiring tactical communication solutions. This provides us with a particularly interesting platform to offer our BNET SDR communication system. RAFAEL has been a communications provider for many years, despite its low profile in this realm. What we offer is a patented system that was developed based on insight with decades of experience in the development of C4I solutions.

RAFAEL holds various patents pertaining to the BNET system, with proprietary capabilities which enable leap frog performance over the competition. This provides unparalleled operational advantage, enabling hundreds and even thousands of users to be seamlessly connected without requiring any communication infrastructure, with superior voice situational awareness and



*The FIREFLY loitering munition is expected to enter service with a launch customer in the course of 2020.*

wide data streaming in the manoeuvring battlefield. We live in a world of IoT, where everything is and needs to be connected, and so does the battlefield. Smart and effective management data dissemination is an essential requirement when looking at today's close combat or large formation battles. RAFAEL has once again tapped into this requirement, and not only are we providing the means to close loops quickly, but years of development of a system that will do just that, FIRE WEAVER, designed to connect all the sensors and shooters in the battlefield, and to manage the attack process, including targeting and fire selection. Fire Weaver instantly selects the most relevant shooter for every target acquired, enabling multiple, simultaneous, precision strikes on time-critical targets within seconds of their acquisition. This capability enables for better usage of the munition and more efficient battle management with lower risk to friendly forces.

**ESD:** How do you assess RAFAEL's short- and medium-term perspectives?

**Har-Even:** I believe that our ongoing annual investment in Research and Development of more than 8% of our revenues each year, our legacy and experience with our local and international customers, our dialogue with the users and our strategy to forge teaming agreements and co-op-

eration with international companies, will continue to bolster our position as a defence company that generates technological breakthroughs, both by forecasting the way the battlefield is evolving and by tailoring our solutions to suit the particular needs of each of our customers. One example of this is our strategic M&A move to acquire 50% of Aeronautics, which now

awaits regulatory authorities' approvals. This will enable RAFAEL to become a provider of 'state-of-the-art' lower-tier tactical UAV class platforms with its advanced ISR and communication capabilities, and more.

**ESD:** Considering that the issue with this interview will be published prior to DSEI in London, what are the particular highlights that you will be presenting at DSEI 2019?

**Har-Even:** At DSEI, we plan to present our all-in-one solution of all combat-proven solutions for armoured vehicles, aimed towards the BOXER and the CHALLENGER, comprised of our 30mm SAMSON RWS, integrated with our SPIKE missile launcher and the TROPHY active protection system for armoured vehicles, heavy, medium-weight and light, operational in the IDF, recently sold to the U.S, and under contract for more than 1,700 units in total. These will be exhibited on a Rheinmetall BOXER AFV model. We will also present our SPIKE Family of multi-purpose missiles including the 5th generation SPIKE LR2 and ER2. In addition, we will have on exhibit the DRONE DOME anti-drone system which we have sold to a number of users around the world, the MIC4AD air defence command and control system.

**The interview was conducted by Jürgen Hensel.**

# “A market leader in its class: Schiebel’s CAMCOPTER® S-100”



Photos: Schiebel

**Schiebel’s CAMCOPTER® S-100 Unmanned Air System (UAS) is a proven capability for military and civilian applications. ESD had the opportunity to talk to Neil Hunter, Director of Business Development at Schiebel Corporation.**

**ESD:** What are your company’s historical roots? In terms of capabilities and products, what developments has the company been subject to since its foundation?

**Hunter:** The Schiebel Group, based in Vienna/Austria, was founded in 1951 and focuses on the development and production of state-of-the-art mine detection equipment and high-tech VTOL Unmanned Air Systems.

Development of the AN-19/2 Mine Detecting Set for the Swedish Army marked the company’s entry into the international market. Further orders from various NATO countries followed and strengthened Schiebel’s world market position. The major breakthrough and world mar-

ket leadership was achieved in 1991, when Schiebel won the contract for the AN-19/2 Mine Detecting Set, designated AN/PSS-12, as standard equipment for the U.S. Army. As a consequence, the company has built an excellent international reputation for the development and production of quality products for military and counter-mine use.

Starting in 1994, Schiebel has also been engaged in the development of unmanned helicopters and, in early 2000, successfully launched the CAMCOPTER® 5.1 UAV System on the market. This system has undergone a complete technical redesign in the following years and was presented to the public in 2005 as the CAMCOPTER® S-100. With its integrated autonomous flight control and unique performance data, this unique VTOL platform won the first major contract for Schiebel from the United Arab Emirates.

The CAMCOPTER® S-100 thus gained a worldwide leading position in the rapidly expanding UAS market.

Growing international interest in the CAMCOPTER® S-100 required the construction of a new production facility in Wiener Neustadt, 40 km south of Vienna. Opened in 2006, this eye-catching, innovative, contemporary design, combines form with functionality and efficiency, much like the S-100 itself. The facility unites generous capacity and location close to Schiebel’s test and demonstration grounds, making it an ideal facility for production, research and development of the CAMCOPTER® S-100.

Since 2010, Schiebel further expanded its technical services with the launch of its Carbon Composites Division, offering high quality custom-made composite services.



*Schiebel’s CAMCOPTER® S-100 has attracted orders from all over the world.*



To better serve customers worldwide, Schiebel maintains offices in Washington, DC (USA), Abu Dhabi (United Arab Emirates) and Shoalhaven (Australia). Schiebel employs around 300 people worldwide. Schiebel is EN 9100 certified for quality management systems in the aviation, space and defense industry.

**ESD:** What are the technology segments and markets that Schiebel is presently covering?

**Hunter:** Mine detection equipment, carbon composites and the CAMCOPTER® S-100 UAS, as described above.

**ESD:** The CAMCOPTER has become a global success story. What does your customer base look like today, and what are the civilian and military applications of this UAS?

**Hunter:** Thanks to the great variety of payloads the Schiebel CAMCOPTER® S-100 is able to carry, it is the perfect asset for a whole range of diverse applications: from power line inspections to anti-smuggling operations, from scanning the sea to leading the fleet, from border control to Search and Rescue. With 16 active customers from all over the world and well over 300 systems sold, the CAMCOPTER® S-100 remains by far the most successful and proven Vertical Takeoff and Landing (VTOL) UAS of its class. It is currently operated by the UAE Army and the Australian Army, as well as various Western European navies, amongst others.

**ESD:** What is it that qualifies the CAMCOPTER for maritime and naval applications?

**Hunter:** There are several key advantages of using Vertical Takeoff and Landing (VTOL) unmanned systems in a maritime environment. As a VTOL platform, the Schiebel CAMCOPTER® S-100 doesn't require a runway or landing equipment and has a minimal footprint, which is perfect for OPVs with small deck sizes. In a typical configuration with a 34 kg payload, the S-100 provides a beyond line-of-sight capability out to 200 km at a service ceiling of up to 5,500 m, delivering a mission-critical aerial view. Furthermore, the S-100 can carry multiple payloads simultaneously and can be reconfigured relatively quickly, offering significant payload flexibility to the user. The demand for the use of VTOL unmanned systems by coast guards and navies is growing steadily. Maritime operations are particularly prevalent with Schiebel customers such as the French Navy. The CAMCOPTER® S-100 has completed thousands of takeoffs and landings from 30+ different ships, qualifying

it as the most reliable, proven choice for the maritime environment.

We are also currently under contract with the European Maritime Safety Agency (EMSA), and anticipate providing simultaneous maritime surveillance services at several sites with various European entities, including coast guards, in fulfilment of the contract.



**The CAMCOPTER® S-100 navigates automatically via pre-programmed GPS waypoints or can be operated directly with a pilot control unit.**

**ESD:** Are you continuing to envisage the German Navy as a potential customer for the CAMCOPTER?

**Hunter:** Schiebel's interest in and commitment to the German market remains strong and we are truly convinced that the S-100 is the best option for any modern European navy.

**ESD:** What is the development potential of the CAMCOPTER? Does Schiebel invest efforts in activities for other solutions in the area of unmanned systems?

**Hunter:** We are confident that the need for Unmanned Aerial Vehicles (UAVs) will continue to grow and that the Schiebel CAMCOPTER® S-100 is in the best position to remain the market-leader in its class of UAVs for land-based and maritime operations. Schiebel reinvests 20% of its profits into research and development to ensure that the CAMCOPTER remains at the cutting-edge of innovation.

**ESD:** In terms of payload and mission equipment fit, what are the options and possibilities that the CAMCOPTER can offer to your customers?

**Hunter:** Rotary-wing UAVs can typical-

ly carry multiple payloads at the same time. The CAMCOPTER® S-100 can fly with a maximum take-off weight of 200 kg. The payload can be split between fuel and sensors, so you can have two, three or four different sensors on board simultaneously. The combination of a top-of-the-line EO/IR camera and a wide area search sensor is a particularly useful

configuration in a maritime as well as land-based environment. Optional payloads include Light Detection and Ranging (LIDAR) scanners, Ground Penetrating Radar for detecting IEDs, SIGINT, as well as underslung loads. We are especially proud of the fact that Schiebel will be the first company to offer a highly productive maritime radar on a rotary tactical UAS. Schiebel is always looking to integrate the newest, cutting-edge payloads that meet the demands of the market and add value for customers' operational needs. In this context we are also working with Ultra Electronics, which makes sonobuoys that sit and listen for submarines, to give the CAMCOPTER S-100 an ASW capability.

**ESD:** What are the rules and limitations that apply to the CAMCOPTER in export programmes?

**Hunter:** Every export of the CAMCOPTER® S-100 needs a prior approval of the Austrian authorities and must comply with the country's as well as European export restrictions and regulations.

**The interview was conducted by Peter Bossdorf.**

# Ukraine's Defence Industry and Partners

**Alex Horobets**

**After the fall of the Soviet Union, Ukraine had the fourth largest and most equipped army in the world. The country also inherited the third most powerful nuclear arsenal after the US and the Russian Federation, with about 1,272 nuclear warheads for intercontinental ballistic missiles in its bunkers.**

Under the prevailing economic conditions of the 1990s, maintaining such an army in fair condition seemed an unlikely hope. Besides, the country harboured hope for a new, peaceful era where such a formidable army would not be necessary. As a young state, Ukraine has taken steps toward disarmament, being closely monitored by the United States and the Russian Federation. Back then, certain approaches were formed to the country's military-industrial complex, which had long-term implications. A huge amount of equipment looked beautiful statistics-wise, but from the first day it required maintenance and modernisation. The Soviet system assumed the production of individual components at various factories scattered across the Soviet republics and their further collection at centralised locations. So, for example, Ukraine lacked capacities for the production of combat helicopters, or various types of ammunition. Existing defence enterprises demanded reform and renewal of production capacities. In this situation, the defence sector demanded "developing-State" programmes for the restructuring of the military-industrial complex. Instead, the principle was taken to re-equip the Armed Forces of Ukraine with weapons and military equipment from Soviet stocks. With this approach, the creation of new enterprises and the financing of defence industry reforms remained secondary. The creation of new defence enterprises, which were, in fact, badly needed, was constantly postponed. An important factor in this approach was the erroneous perception of military threats by the country's political leadership: the outbreak of a regional war was considered unlikely. In these circumstances, by the 2000s, Ukraine had completely failed

to tackle the consequences of the collapse of the military-industrial complex of the former USSR.

## Losses of Defence Companies due to Russian Aggression

The military-industrial complex of Ukraine today consists of state-owned and private enterprises that fulfil the state defence orders and export contracts. Since 2014, there has been an increase in the effi-

ing in cartridge production, including the NATO standard 5.56x45mm); Topaz State Joint-Stock Holding Company (specialising in the development and production of complex radio systems and complexes, including long-range radio reconnaissance and early warning air defence systems); Snizhne Machine-Building Plant (which produced components for helicopter engines); and Yunost, which made components for the aerospace and aviation industries, among others.

Photo: Wikipedia



**The Ukrainian BTR-4MV1 Armoured Personnel Carrier (APC) underwent factory tests in 2017. The combat vehicle was produced using technological solutions in line with armoured vehicle trends in NATO countries.**

ciency of the Ukrainian defence industry and a rise in production volumes. After the termination of military-technical cooperation with Russia, the most important task was to establish mechanisms for importing substitutes for Russian components, as well as a reorientation to cooperation with other countries.

As a result of the annexation of Crimea, Ukraine has lost many defence enterprises. Today they are being exploited by Russia to produce its own military products. The Russian Federation looted from the Ukrainian Donbas the capabilities of a number of defence enterprises. Among them are Luhansk Cartridge Plant (the factory specialis-

In 2014, employees of Topaz Plant reported that Moscow-backed militants exported to Russia not only technical equipment, but also the finished MANDAT radar jamming system. Ukraine immediately took steps to restore at other defence enterprises the capabilities it had lost. For example, the Defence Industry Courier news agency reported that, in 2017, Iskra Research and Production Complex became the host of a new production line for military equipment, the MANDAT B1E electronic warfare complex and the R-330TRC electronic warfare station. In the same year, the enterprise handed over two new stations of the RE-R-330UM MANDAT-B1E complex to the Armed Forces of Ukraine.

## Author

**Alex Horobets** is an analyst for international and Arctic affairs based in Kyiv, Ukraine.

## Approaches to Modernising, Creating new Weapons

The state-owned Ukroboronprom has been playing the main role in the Ukrainian defence industry. Since its founding in 2010, the defence giant, which united disparate defence enterprises under a single brand, has been facing waves of criticism. However, in 2014, the Concern had to respond to an urgent demand for the production and repair of military equipment, and the enterprises that are part of Ukroboronprom upped the quantities of new weapons and military equipment production, also setting up the process of repair and modernisation of equipment that had been in storage. Circumstances indicated that in the foreseeable future the country could not do without the production of new, modern weapons with the latest developments and technology.

The Ukrainian defence industry is seeing a significant increase in funding. The press service of the Ministry of Economic Development of Ukraine says that financing has been increased 100 times in recent years – from UAH 30M in 2016 to UAH 3.2Bn in 2018. Defence companies have used these funds to implement more than 200 projects in the latest weaponry and military equipment. Since 2014, the country's defence and security agencies have received about 26,000 weapons and items of military equipment, 7,000 of which are new or modernised models.

Thanks to the developments of the Kyiv-based State-owned Luch Design Bureau, domestic high-precision anti-tank weapons were created, including anti-tank systems that have already been used by Ukrainian troops in the East of the country. According to the report, certain features of Ukraine-made weapons even surpass those of US-made JAVELINS.

A number of projects have been implemented in armoured vehicle production. Upgrades continue of the OPLLOT main battle tanks, which, in particular, are being exported to Thailand. According to Defence Industry Courier, by 2018 about a dozen new research and development projects had been successfully implemented in relation to the said MBT. According to the Chief of the Defence Express consultancy, Serhiy Zgurets, the Ukrainian Army will boast of its first complete OPLLOT tank company as early as 2019-2020.

Work has continued on modifications to the BTR-4MV1 APC, which in 2017 underwent factory tests. This combat vehicle was produced using technological solutions in line with the latest trends in the development of armoured vehicles in NATO



Photo: Vasily Koba

**A Ukrainian-made Antonov An-178 in military grey colours**

countries, as well as using the experience of BTR-4 operations in the combat zone. Thanks to the modular principle, the BTR-4MV1 can quickly be adapted to perform specialised tasks: modifications range from a patrol reconnaissance vehicle to an amphibious vehicle for the Marines.

In August 2019, Ukroboronprom's press service announced that Lviv Armoured Plant launched a serial modernisation of the T-64 tanks of the 2017 model. During modernisation, a new gunner sighting system with a thermal imager is installed, ensuring enemy detection, recognition and destruction at any time of the day and in any weather conditions. In addition, the T-64 / 2017 received a new dynamic protection and a satellite navigation system by Orizon-Navigation SE. The navigation complex operates in an automated digital system, allowing online data exchange via encrypted channels. The MBTs are equipped with the new LYBID K-2RB digital radio stations, providing reliable protection against interference and interception of communications at distances up to 70 km.

Thanks to the capacities of Lviv Armored Plant, the process of re-equipping the Ukrainian Army with modernised vehicles will go much faster, since previously it was only Kharkiv Armoured Plant that was able to upgrade T-64 tanks to this level. Ukroboronprom notes that, given stable orders and financing, the capacities of two tank enterprises will allow for modernisation of all T-64s in the near future.

One of the priorities of modernisation and rearmament in recent years has been the creation of missiles and missile systems. In particular, to upgrade Ukraine's coastal defences, tests were carried out of the NEPTUN anti-ship complex, capable of hitting targets at a distance of up to 280 km. According to the claimed features, the complex works effectively under counter-fire and electronic warfare countermeasures. The system is al-

ready actively offered for export in coastal and missile versions. An air-based version of the NEPTUN anti-ship missile, designed to be carried on such aircraft as SU-24s and Su-27s, has also been announced.

In 2018, tests were conducted of the VILKHA multiple launch rocket system developed by the State-owned Luch Design Bureau, which led to the decision to start serial production and to take it into service. VILKHA has a range of about 70 km, allowing the operator to assign each missile a separate target. In 2019, it was announced that production of the VERBA multiple launch rocket systems and the VILKHA launchers were launched at the Shepetivka Repair Plant, and supplies to the Army would soon begin. The VERBA MLRS is the new generation of GRAD, equipped with modern navigation gear and improved platform stabilisation to enhance accuracy. It is capable of hitting targets at 40 km range.



Photo: Wikipedia

**In July 2017, NATO Secretary General Jens Stoltenberg met with the then head of Ukroboronprom, Roman Romanov.**

Serhiy Zgurets, head of the Defence Express consultancy, notes that Ukraine does not focus on creating a single type weapon, instead opting to develop a wide variety. In 2018, Yuzhnoye Design Bureau was actively working on the creation of SAPSAN, an operational-tactical complex able to strike targets at a range of up to 500 km. In early 2019, Chief of the General Staff of the Armed Forces of Ukraine, Viktor Muzhenko, announced the completion of tests of the upgraded KUB and TOR anti-aircraft missile systems, which are set to enhance the potential of the Armed Forces and the

port Control Service of Ukraine, from 2014 to 2018, Ukraine sold almost 200 combat vehicles. In particular, in 2014, exports of armoured combat vehicles stood at 28 units, including 15 BTR-3E1s and 2 BTR-3M2s to Thailand, 10 BTR-4ENs to Nigeria, and a BTR-4 to the US. Ukraine exported 20 armoured combat vehicles to Thailand: two BTR-3M1s, a BTR-3M2, six BTR-3RKs, two BTR-3BRs, a BTR-3S, and eight BTR-3E1s. In 2016, Ukraine exported 147 armoured vehicles to the UAE, Thailand and Indonesia. Also, Ukraine was exporting tanks. From 2014 to 2018, 107 battle tanks were

the 30 countries that are the main export partners. Among them are India, Algeria, Myanmar, China, and Equatorial Guinea. Basically, the business will be about modernisation of Soviet aviation equipment, armoured vehicles and air defence systems.

The European market takes up several percent in the structure of Ukrainian arms exports. Cooperation with Poland is worth highlighting; in 2016, a total of 40 R-27 guided missiles were sold there. According to the former deputy CEO of Ukroboronprom, Denys Hurak, Poland was the first country to understand that it was strategically important for them to cooperate with Ukraine in defence production. A number of joint projects are now being implemented, ranging from ammunition to radar equipment.

The trend of deepening cooperation in the defence sector with other countries should be noted. In particular, Ukrainian defence enterprises continue to cooperate with Turkey. Ukraine already uses the Turkish BAYRAKTAR TB2 strike drone. According to media reports, six strike drones, two control stations and 200 guided missiles were included in the contract. In August 2019, it became known that Ukrspetsexport and Baykar Defence of Turkey created a joint venture in the field of precision weapons and aerospace technologies. The main goal of combining the capabilities of the two countries' defence companies is to establish mass production of new models of modern weapons for their respective armies. The first project will be to develop a new generation of strike drones.

Ukraine continues its cooperation in the defence sector with the US and Canada. According to the Embassy of Ukraine in the United States, by the end of 2019 a contract for the purchase by Ukraine of a large batch of lethal weapons may be implemented. Following a meeting between Ukraine's Minister of Internal Affairs and the Minister of Defense of Canada, reports came that preparations were underway to sign a contract for the supply of modern armoured vehicles and certain weapons components to Ukraine.

According to Defence Blog, facilities are being set up in Myanmar for the production of armoured vehicles and Self-Propelled Artillery, as well as aircraft and ship engine repair.

As part of the 53rd Paris Air Show 2019 at Le Bourget, a number of joint defence projects were launched between Ukraine and the United Arab Emirates. Among the most promising ones is the establishment of joint production of unmanned aerial vehicles based on projects by Antonov SE. Ukroboronprom CEO Pavlo Bukin consid-



Photo: President.Gov.ua

**Against the background of presidential elections in Ukraine, discussions on reforming the defence industry and enhancing defence management received a boost: defence reform is a key challenge facing Volodymyr Zelensky, particularly regarding Ukroboronprom.**

country's air defence system. In 2018, the Ministry of Defence of Ukraine decided to modernise and return to service both anti-aircraft missile systems.

In recent years, private defence enterprises have reached a new level of quality. According to Defence Express there are about 200 private defence enterprises with positive potential operating across Ukraine. Private enterprises take half of the orders from the Armed Forces of Ukraine, determined by the State Defence Order. In addition, exports of private defence enterprises is also increasing. In August 2019, the Government of Ukraine, by resolution, entitled a number of private defence enterprises to export and import military goods of their own production. Among them are Raidoniks, Ukrainian Armoured Vehicles, and Praktika.

### Ukrainian Arms Exports

A significant share of Ukrainian arms and military equipment supplies is armoured vehicles and tanks. According to the State Ex-

ported. A significant part of the exports was bound for Thailand.

In July this year, Ukroboronprom announced that the first BTR-3KSh machine kit (command vehicle) was delivered to Thailand for licensed assembly. Ukroboronprom CEO Pavlo Bukin considers the move a marker of deepening cooperation between Ukraine and Thailand – the country's strategic partner in Southeast Asia. Also, according to Mr Bukin, the expansion of export supplies is the only way to ensure the innovative development of companies that are part of Ukroboronprom.

Ukraine is successfully exporting anti-tank missile systems developed by Luch Design Bureau. A major buyer of ATGMs is Saudi Arabia, where in 2018 a total of 950 launchers and ammunition were delivered. In 2019, Saudi Arabia continued procuring ATGMs. Among other buyers of the Ukrainian STUHNA and KORSAR anti-tank missile systems are Jordan and Egypt.

In March 2019, Ukraine's Spetstechnoexport SE announced the signing of contracts with

ers the markets of the Middle East and Southeast Asia to be promising for Ukrainian An-family aircraft, since such planes are capable of operating in extreme climatic conditions and they fully meet the requirements of military and rescue operations.

In August 2019 reports also arose that Ukroboronprom had won a tender by the Ministry of Internal Affairs of Peru for the purchase of military transport aircraft. In the Peruvian tender, the Ukrainian An-178 beat the C-27 SPARTAN (US/Italy) and C-295 (Airbus). According to Pavlo Bukin, Peru may become a "pioneer" for the import of new aircraft created at Antonov SE. The An-178 completed its first flight on May 7, 2015 and is now in the process of certification. In July 2018, Ukroboronprom showcased the An-178 at the Farnborough Airshow, where the aircraft performed a demonstration flight.

## Reforming the Ukrainian Defence Industry

In 2018, the Government of Ukraine adopted the Defence Industry Development Strategy, through to 2028. This document defines the long-term priorities of State policy in the field, and direction for implementation of medium-term defence industry reforms. The Strategy's main goal is to create conditions for the modernisation and accelerated development of the military-industrial complex, building up own production capacities to meet the needs of the Armed Forces, as well as manufacturing weapons and military equipment that are competitive on the world market. The implementation of the Strategy should allow for comprehensive restructuring of State governance of the defence industry, as well as defence companies' organisational and production performance. It is in relation to State governance of the defence industry that most discussions are unfolding at the expert and State levels. As for the modernisation of military equipment and new developments, Ukrainian enterprises are implementing a wide range of projects.

Meanwhile, Washington has been closely watching the reform of the Ukrainian defence industry, and according to the League of Defence Enterprises of Ukraine (an association of private Ukrainian enterprises and organisations producing defence and dual-use products), a US delegation led by Donald Winter, a senior defence reform advisor, visited Ukraine in June 2019. The American delegation looked into the potential of the nation-



Photo: Wikipedia

*The Ukrainian VILKHA tactical missile system on display at the Independence Day military parade in Kyiv in 2018*



Photo: Wikipedia

*The Ukrainian SAPSAN tactical missile system at the same parade in Kyiv.*

al defence industry's private segment, as well as the current state of affairs in Ukraine's defence and security sector. According to estimates, the recommendations prepared during the visit could shape Washington's updated policy on bilateral military-technical cooperation with Kyiv. In particular, reform is expected of Ukroboronprom Concern, of State governance in the defence industry, further integration of the national defence industry into the global arms and military equipment market, and the removal of regulatory restrictions in order to attract private investment in the defence sector.

Against the background of presidential elections in Ukraine, discussions

on reforming the defence industry and enhancing defence management received a boost: it is precisely defence reform that many believe is one of the challenges facing Volodymyr Zelensky, above all regarding Ukroboronprom. The President's first foray into the foreign political arena showed that he pays due attention to security and defence: during his official visit to Turkey an agreement was signed on setting up a joint defence enterprise. Also, the Ukrainian President and the Prime Minister of India, Narendra Modi, have tentatively discussed expansion of military-technical cooperation between India and Ukraine. ■



Photos: FNSS

## “FNSS – a renowned defence company”

**This year the Turkish defence company FNSS celebrates its 30<sup>th</sup> anniversary. ESD had the opportunity to talk to Kadir Nail Kurt, General Manager and CEO.**

**ESD:** First of all, congratulations on the 30th anniversary of your company. Please highlight the journey of FNSS and its successful evolution of projects over the last 30 years.

**Kurt:** We celebrate our 30th anniversary as ‘a world renowned and respected Turkish defence company’. Starting with the contract for our point programme of Armoured Combat Vehicles (ACV) production, we evolved into a global company that creates value by designing, developing and delivering tailored made solutions. The KAPLAN family of vehicles pushed the Infantry Fighting Vehicle (IFV) class into the 21st Century. The PARS family of vehicles has become a point of reference for tactical wheeled armoured vehicles. We designed and developed highly specialised platforms like the Marine Assault Vehicle (MAV), the OTTER Rapid Deployable Amphibious Wet Gap Crossing System and the Armoured Amphibious Combat Earthmover (AACE). Our modernisation solutions such as the M113A4 are unique, and our turrets like the SABER and TEBER serve to considerably increase combat effectiveness.

We deliver innovative solutions with a team of over 1,000 competent and dynamic employees. With the Alpha Leadership Academy Programme, we have started training the leaders of defence industry.

We have delivered over 4,000 combat platforms from the 15 tonnes class of tracked armoured vehicles to medium weight class tank and 4x4 and 8x8 tactical

wheeled armoured vehicles; from combat engineering vehicles to modernisation and sustainment solutions for aged armoured vehicles, to our users in different countries. In 30 years, we have proven that we are a successful and trusted supplier and business partner, with every programme we have delivered.

In summary, over the course of 30 years, FNSS has evolved from a single product, single customer and single location company to a multi-product, multi-customer and multi-location company.

**ESD:** Maintaining sustainability in the highly competitive armoured vehicle market is difficult. What can you tell us about FNSS's export activities and ongoing international programmes?

**Kurt:** We have ongoing projects for both tracked and wheeled armoured vehicles in the Middle and Far East. These are the most important export markets for us. So far, we have exported complete vehicle systems to seven countries, and subsystems, parts, and services to many more countries. The volume of our export



**The remote-controlled SHADOW RIDER system**

projects to date has exceeded US\$2.6Bn. We have generated almost all of our revenues from exports for many years now. Approximately 80% of our turnover in 2018 consisted of export sales.

We are working on the projects in Sultanate of Oman, Saudi Arabia, United Arab Emirates, Malaysia and Indonesia. We provided an effective solution to the Royal Saudi Armed Forces on the mod-

ernisation of M113 Armoured Personnel Carriers. More than 1,000 M113s in various configurations have been modernised to M113A4 level since 2004. On the other hand, the 120mm mortar integration project continues without a problem. We delivered 160 vehicles for the Malaysia AV-8 GEMPITA project, which includes the development, production, and delivery of 257 8x8 Wheeled Armoured Vehicles in 12 configurations. The design process for 11 configurations has been completed. Nine different configurations have already entered the service and the other two configurations will be added to the inventory this year. These vehicle configurations include: the Reconnaissance and Command vehicle with the FNSS 25mm SABER turret; 120mm Mortar Carrier; Armoured Engineering Vehicle; Armoured Recovery Vehicle; Armoured Ambulance; and Armoured Personnel Carriers.



**FNSS has been investing heavily in the development of UGVs such as the SHADOW RIDER.**

ernisation of M113 Armoured Personnel Carriers. More than 1,000 M113s in various configurations have been modernised to M113A4 level since 2004. On the other hand, the 120mm mortar integration project continues without a problem.

We delivered 160 vehicles for the Malaysia AV-8 GEMPITA project, which includes the development, production, and delivery of 257 8x8 Wheeled Armoured Vehicles in 12 configurations. The design process for 11 configurations has been completed. Nine different configurations have already entered the service and the other two configurations will be added to the inventory this year. These vehicle configurations include: the Infantry Fighting Vehicle equipped with the FNSS 25mm Sharpshooter Turret; the Armoured Fighting Vehicle equipped with the LCT 30 two-man turret manufactured by Denel Land Systems with a GI30 30mm gun and a 7.62mm coaxial Machine Gun; the Armoured Reconnaissance/Surveillance Vehicle; Armoured Command Vehicle; Armoured Personnel Carrier equipped with a 12.7mm remote-controlled weapon station; Armoured Ambulance; Armoured Repair Vehicle (ARV); 120 mm Armoured Mortar Carrier (AMC); and Armoured

vehicle configurations include: the Reconnaissance and Command vehicle with the FNSS 25mm SABER turret; 120mm Mortar Carrier; Armoured Engineering Vehicle; Armoured Recovery Vehicle; Armoured Ambulance; and Armoured Personnel Carriers.

We signed a preliminary agreement with PT-Pindad, our business partner in Indonesia, at IDEF 2019 for the joint serial production of KAPLAN Medium Weight Tanks. The development process of the KAPLAN-MT has been completed successfully within the framework of a joint development project. We also continue our business development activities in other regions where we see potential such as in Latin America.

**ESD:** At IDEF 2019 in Istanbul, you exhibited various highly innovative armoured vehicles. However, I would like to limit myself to one product: the SHADOW RIDER. It is an armoured tracked vehicle steered by a remote control system. How do you assess the development and importance of remote control systems into autonomous systems for armoured vehicles in the future and where do you want FNSS to position itself here?

**Kurt:** FNSS is a company that allocates considerable resources to research and development within the sector. In doing so, our primary goal is to expand the technology base of the sector, and the SHADOW RIDER stands as an important reflection of this strategy. There are two major benefits of developing remote control systems for armoured vehicles. First, it gives the opportunity to bring end-of-lifetime vehicles in the inventory back into the field again for multiple logistics supported purposes. Second, it is the first mandatory step to developing autonomous systems for armoured vehicles. In the mid-term, we are preparing ourselves to develop and introduce many different types of unmanned land vehicles, and have already launched important works in this regard.

**ESD:** FNSS will be exhibiting at the DSEI in London this September. What are FNSS's aims in London?

**Kurt:** This will be the first time FNSS will be exhibiting a vehicle in DSEI London. FNSS's previous experiences in attending international shows have proven highly beneficial in strengthening our relationship with officials and end users, especially in regions where FNSS was awarded contracts such as in South-East Asia. The decision to participate runs parallel to FNSS's vision of being a global partner in defence. Therefore, using opportunities to showcase our capabilities to a broader audience and further expanding our communications with customers will always be a major motivation.

**ESD:** Where do you see FNSS in 30 years from now?

**Kurt:** I see FNSS as 'the' Turkish defence company in the world. We shall continue to design and develop future's vehicle concepts, shaping our product portfolio and technology roadmap in line with these developments by considering the benefits of all the stakeholders and adding value by providing sustainable solutions. We shall advance further with every project we implement. Today, we deliver innovative solutions to our customers through the entire product lifecycle. Alpha Leadership Academy, we already have started training the leaders of tomorrow, who will be carrying the legacy of the past 30 years into the next 30. FNSS has always been in the service of those protecting the homeland, and will continue doing so into the next 30 years.

**The interview was conducted by Korhan Özkilinc.**

# Mastering Mobility

David Saw

The picturesque town of Limoges in the Haute-Vienne department of central France is the location of Texelis, an innovative company that has emerged as a major player in French armoured vehicle programmes. The company now has plans to grow further into the French and international wheeled armoured vehicle markets.

Texelis was originally part of Renault Vehicules Industriels (RVI), being established in 2008 as a wholly-owned subsidiary of RVI providing axles and power trains. In October 2009 RVI sold Texelis to new external shareholders, and then in

The roots of the Texelis business were in the supply of truck axles, and this specialisation saw them selected to supply axles to Mack Trucks in support of a truck contract from the Canadian Forces for 1,535 vehicles. This Canadian contract will see Texelis supply some 6,000 axles, and the contract will be completed this year. This truck expertise, added to its ability to provide complete mobility solutions, also puts Texelis in a strong position to compete for a major French Army programme for logistic and tactical trucks to replace the legacy vehicle fleet. In total 7,700 trucks will be required.

The programme that has changed the destiny of Texelis in a defence context and allowed the company to become a key player in wheeled armoured vehicles is the Véhicules Blindés Multi-Rôles (VBMR) Léger SERVAL. This is a lightweight multi-role armoured vehicle that will be produced in three different versions and 16 separate variants. SERVAL is one of the new generation armoured vehicles being acquired under the French Army Scorpion programme and in total 2,038 vehicles will be acquired through to 2025, with the first tranche consisting of 636 vehicles (contract announced in February 2018). The possibility also exists that the French Gendarmerie and the Police National could also select the vehicle to meet their protected mobility needs.

Texelis and Nexter had signed a contract to work together on the SERVAL programme in February 2017, Texelis supply the complete mobility solution in 27 kits to Nexter who then integrate these with the vehicle body that they produce, install the other required equipment and then deliver to the customer. The Texelis mobility solution includes an independent suspension system, engine, gearbox, structure for batteries, protected fuel tank, alternator, automatic pre-heating, winch and subframe. Three SERVAL prototypes have been built and are currently in testing, with the programme running to schedule.

Winning the SERVAL programme has catapulted Texelis into the front-rank of French wheeled armoured vehicle contractors and made them one of the four companies, along with Nexter, Arquus and Thales, that

are the primary armoured vehicle suppliers under the Scorpion programme. Texelis are now looking towards two new Scorpion armoured vehicle programmes to expand their defence portfolio.

The first of these programmes is the Véhicule Blindé d'Aide à l'Engagement (VBAE) that will replace the existing Panhard VBL, with first deliveries from 2025 onwards. This will have a gross vehicle weight in the eight to ten ton range, will be a 4x4 vehicle, with increased protection compared to the VBL and a number of different variants are required. Key factors for VBAE are high mobility and a low signature to enable it to perform reconnaissance missions with reduced chances of detection.

Meeting the VBAE requirement has led Texelis to ponder offering different drive line solutions, the first of these would offer a traditional automotive solution with the addition of an electric motor to reduce noise signature in close contact environments. The other alternative is a hybrid solution combining diesel and electric engines. Texelis have significant experience in electric/hybrid systems from their railway/transport business and have also worked with Renault on hybrid solutions for light commercial vehicles. VBAE will be a major programme, with large numbers of vehicles required,

The other Scorpion programme is for the MAC engineer combat support vehicle, here the aim is to acquire a new wheeled vehicle for mobility support and obstacle clearance, with equivalent mobility to the other wheeled systems acquired under the Scorpion programme, with some 100 systems required. MAC will replace the current Engin Blindé du Génie (EBG) which is based on the AMX-30D tank chassis.

Apart from French armoured vehicle programmes, Texelis is also working on numerous international programmes in Europe, the Middle East and beyond. The fact that France classifies the vehicle mobility solutions that Texelis offers as commercial rather than defence products eases export possibilities. The company believes that international markets will make a major contribution to their future growth. ■



Photo: Nexter

**Texelis provides the mobility solution for the Véhicules Blindés Multi-Rôles (VBMR) Léger SERVAL, where they work with Nexter. Under the SCORPION programme the French Army will acquire 2,038 SERVAL vehicles with deliveries continuing through 2025.**

December 2018 there was a management buyout of Texelis, supported by external investors. At present some 44% of company business comes from the defence sector and 41% from the railway/transport sector; according to Texelis President Charles-Antoine de Barbuat their objective is to increase the defence element of their business to 60% of the total.

## Author

**David Saw** is a specialist defence writer based in Paris, France. He has a long and comprehensive record of writing and managing defence magazines at the highest level, from the USA through Europe to Asia, and is now a regular contributor to ESD.



Photos: PIK-AS



## Interview with Christina Polster, DI(FH), CEO of PIK-AS Austria GmbH

**ESD: PIK-AS is a family enterprise: can you tell us a little bit about how the company came to be, what have been its guiding principles, and how has it changed and grown over the last few years.**

Polster: For almost 40 years PIK-AS Austria has been pursuing one strong, core principle: Support international industries with compact but robust products with the highest quality.

When my father Franz Polster founded and settled the company's headquarters in Mariasdorf, Austria, he started with one employee who would stand by his side until retirement.

Whilst growing continuously, PIK-AS established itself – mainly within Eastern Europe – as a trusted and exclusive sales partner for electromechanical products such as power relays, power connectors or special switches for the machine building and special-purpose indus-



**Managing in the family: Franz and Christina Polster.**

tries. To get to know the market and our clients better, PIK-AS established sales organisations in different countries, and it became increasingly clear that the defence industry is a strong match to our core principle.

The turn of the millennium was also a kick-off for Franz to change the business from being a strategic sales partner of manufacturers to a manufacturer itself. This contemporary and strategic change was even continuing in 2012, and at that time I decided to focus the leadership of PIK-AS and aim it strongly at the military market. My primary objective was to continue the successful story of PIK-AS, keeping the

company growing, but nevertheless flexible and manoeuvrable to suit the occasionally volatile market surroundings.

In 2015, the successful transition was completed, and since then I am head of the PIK-AS Group.

**ESD: You supply specialised components (switches and relays and the like) for demanding but diverse markets. Is the military market the most challenging? Is there significant crossover of technology and basic principles between the sectors you supply? And given the very broad geographical markets to which PIK-AS delivers, do they offer specific technological challenges?**

Polster: I have always had an interest in the company's business, and my father introduced me to different markets from a very young age. From those impressions, I was inspired to work in the military business! This market is totally fascinating and demanding: business partners need products that come in low(er) quantities, are of the highest quality, with long qualification and certification tests – and all while meeting their tight budgets!

Our products are developed to deliver, and certified according to various military standards. Let me give you an example... In all modesty, our LED interior lights are true masterpieces. They are specifically designed to meet EMC, temperature, shock and vibration requirements – and we even had the chance to successfully test them against blast!

We work worldwide, with different requirements and standards from our customers. It is important to know that most OEMs are struggling with budgets – and new technologies aren't cheap. We want to be sure to work according to the industry's needs, so we have to be as close as possible during the development process.

**ESD: To what major factors do you attribute the success of PIK-AS over the years, particularly towards the military market?**

Polster: We love to be a private, midsized and flexible company. Thus we have an important strength: We are adaptable, but always providing the highest quality and the most reliable products. PIK-AS works closely with several major OEMs of military vehicles but there is another exciting area we are perfectly trained in: we directly support armies in developing solutions where the requirements are coming right from the soldiers – it's they who need to work with the equipment and it is essential to respect their needs!

We live communication: We participate on a lot of local tradeshows, respecting the local economy and having native speakers in our company to best support the engineers. Our

customers and suppliers appreciate that we work in a trustful, responsible way with them: a handshake is enough. Every PIK-AS team member strives every day to provide the best service and support.

**ESD: Looking ahead, radio frequency security is highly suspect in these increasingly "cyber-aware" times. Does this trend have any impact on your business?**

Polster: We have to remain alert to any potential threats within RF-security, but in regards to our portfolio there is only a small range among our product portfolio involved – so far.

**ESD: When will you next be looking back at your recent / short-term achievements? And what will those achievements be?**

Polster: 2018 and the first half of 2019 were outstanding in terms of receiving high-volume OEM-contracts. Our target for 2020 is to focus on the Middle Eastern countries, where there



**Installed map reading light in a protected vehicle**



**PA293007 medical high-intensity light**

is a clear demand for high quality parts, especially when it comes to temperature sensitivity. So, local visits and participation at IDEX 2021 will be on our schedule, as well as Eurosatory 2020 in Paris.

We are also looking forward to new developments! I mentioned the LED interior lights where we just created a special version for military ambulances with white and blackout light including a stepless dimming possibility. We are able to provide best lighting conditions for medical treatment in the field.

Please stay tuned for a great release at the end of 2020, once we have finished our testing and qualification phase, with a special switching solution sector!

**The interview was conducted by Stephen Barnard.**

## Serbia to Buy MISTRAL

(ck) On 16 July, on the occasion of the visit of French President Emmanuel Macron to Serbia, the Serbian MoD signed a contract with MBDA for the acquisition of MISTRAL 3 short-range air defence systems. This or-

Photo: MBDA



der makes Serbia the 32nd customer country for the MISTRAL missile. The contract is for the acquisition of MISTRAL missiles, launchers for dismounted soldiers, related equipment and logistics, and the provision of technical and material assistance for the integration of the MISTRAL missile on the PASARS vehicles of the Serbian Armed Forces. MISTRAL 3 is the latest generation of MISTRAL missiles currently in service. It features high resistance to infrared countermeasures and a capability to engage air targets presenting a low thermal signature, such as missiles and UAVs.

## New CEO at Patria Group

Photo: Patria



(ck) Patria's Board of Directors has appointed Esa Rautalinko, 56, Master of Science (Economics), as President and Chief Executive Officer of Patria Group. Chief Financial Officer Ville Jaakonsalo has been acting President and CEO since January 2019. Rautalinko is currently the CEO of Örum Group and has also been Patria's Chairman of the Board of Directors since November 2018. He has extensive leadership experience in domestic and international companies and on the boards of several companies and organisations. In his new position, Rautalinko will be responsible for the company's internationalisation strategy and for maintenance, repair and overhaul (MRO) strategy development.

## Czech Republic Signs Acquisition Contract for 62 TITUS

(ck) The Czech MoD has purchased 62 TITUS armoured vehicles from Nexter. TITUS is the latest generation of 6x6 armoured vehicles, conceived by Nexter to

answer the support and transport vehicles requirements of modern armies by offering a high level of protection, mobility and versatility, as well as controlled ownership costs. TITUS' mobility chain was developed in cooperation with Czech supplier Tatra Trucks. A "Homeland Security" kit is available, geared more specifically to the needs of police and security forces. The Czech order involves 3 variants of TITUS: Commanding Post (CP), Transmissions, and Artillery Fire Coordination Post. ELDIS (CSG Group), Nexter's partner for this Czech Republic project, carries the main contract with the MoD and will organise the licensed local production.

## 10th Intelligence Workshop Achieves Record Figures

(ck) This year's PLATH Intelligence Workshop, which traditionally opens the EW Europe conference in Stockholm, achieved record figures in its 10th edition with over

Photo: Plath



500 participating experts from more than 40 countries. The first PLATH Intelligence Workshop was launched in 2011 as a forum for communications intelligence. The objective was to create a platform for users and providers in the field of communications intelligence that would provide information about industry trends, promote exchange among experts and provide a networking opportunity. The event has long been an annual 'must' for the industry and this is ensured, primarily, by contributions from high-ranking users of the technology and company representatives. Key issues this year were Cyber Defence, Artificial (Signal) Intelligence, and Multi-Domain Intelligence. The opening presentations were well received. Brigadier General Armin Fleischmann (Cyber and Information Domain Service Headquarters, MoD Germany) spoke about the influence of digitalisation on the current threat situation and the resulting role of the military. Lieutenant Colonel Holger Schmor (Joint Electronic Warfare Core Staff, NATO) addressed the requirements for communications intelligence in modern warfare.

In keeping with tradition, the Intelligence Workshop was followed by the opening of the exhibition. The Intelligence Workshop 2020 will take place in Liverpool.

## Raytheon to Upgrade Germany's PATRIOT

(ck) Raytheon will upgrade Germany's PATRIOT Integrated Air and Missile Defence System to the most current configuration under a US\$105.5M direct commercial sales contract from the NATO Support and Procurement Agency. The contract award was first announced on Raytheon's

Photo: Bundeswehr



earnings call on 25 July. The upgrade is to ensure that Germany's air and missile defence remains current until at least 2035. The contract comes shortly after the Defence and Budget Committees of the German Federal Parliament approved the upgrade, ensuring that Germany remains aligned with five other EU and NATO allies that rely on PATRIOT for their air and missile defence. PATRIOT has been used in combat, successfully, more than 250 times to defend allied forces and civilian populations against hostile aircraft, drones and tactical ballistic missiles.

## Rheinmetall and BAE SYSTEMS to Cooperate

(ck) Rheinmetall and BAE Systems have

Photo: Rheinmetall



launched a UK-based joint venture for military vehicle design, manufacture and support – known as Rheinmetall BAE SYSTEMS Land (RBSL). Headquartered in Telford in the West Midlands, the joint venture will sustain around 450 jobs across the UK. RBSL intends to play a major role in manufacturing the BOXER 8x8 for the British Army's Mechanised Infantry Vehicle (MIV) programme and other strategic com-

bat vehicle programmes. RBSL will draw on Rheinmetall's military vehicle technologies combined with the additional systems brought to the Joint Venture by BAE SYSTEMS' Land UK business, such as TROJAN, TERRIER, WARRIOR, military bridging and the AS90 self-propelled artillery system. Regulatory approval for the joint venture was granted on 13 June 2019. Rheinmetall Defence is one of the world's leading makers of military vehicles and systems. In the UK the group is already present in the form of Rheinmetall Defence UK and Rheinmetall MAN Military Vehicles UK. BAE SYSTEMS has been the UK's premier land systems manufacturer for many decades. BAE SYSTEMS companies have produced the CHALLENGER 2 main battle tank, the WARRIOR infantry fighting vehicle as well as the TERRIER combat engineering vehicle.

### Rheinmetall to Expand into Autonomous Driving

(ck) Current trends point to unmanned ground vehicles playing an increasingly important role in future military operations on land, much like unmanned air



Photo: Rheinmetall

vehicles in an aviation context. Some will serve in an unarmed logistic or reconnaissance role; others will function as mobile weapon platforms. Rheinmetall has generated great interest with its MISSION MASTER unmanned multi-mission vehicle, which is based on Provectus technology, modified for military use by Rheinmetall Canada. In an attempt to boost its capabilities in robotics and autonomous driving, Rheinmetall has bought the Canadian company Provectus Robotics Solutions. Founded in 2010, Provectus is a company specialising in the development of robotic systems and software. The buyout is part of Rheinmetall's strategy of positioning itself as a supplier of cutting-edge technology around the world, but particularly in Canada where the Group is a longstanding partner of the country's armed forces. Rheinmetall is eager to apply expertise from Provectus in implementing ISTAR, a major project of the Canadian armed forces now underway.

### New CEO at Schiebel Aircraft Inc.



Photo: Schiebel

(ck) With the appointment of Gretchen West as President and CEO, Schiebel Group wants to boost the expansion of its US subsidiary, Schiebel Aircraft Inc. Schiebel anticipates tremendous opportunities in the US defence, civil and commercial markets for its CAMCOPTER S-100 UAS. Most recently, Gretchen West served as a senior director in the Global Unmanned Aircraft Systems (UAS) practice group at leading law firm Hogan Lovells focusing on drone policy initiatives and strategies for commercial drone market expansion. She also serves as Co-Executive Director of the Commercial Drone Alliance, an independent non-profit, where she advocates on behalf of the commercial drone industry for a stronger and expanded policy and regulatory environment for UAS integration. Prior to those roles, Gretchen served as Executive Vice President at AUVSI where she oversaw the association's advocacy, business development, and strategy efforts.

### Schiebel to Cooperate with Air Affairs Australia

(ck) Schiebel Pacific Ltd (SPL), a subsidiary of the Vienna-based Schiebel Group, designer of the CAMCOPTER S-100 Unmanned Air System (UAS), has opened a new office and workshop at the Albatross Aviation Technical Park (AATP) in Yerrilyong, New South Wales, and announced its cooperation with Air Affairs Australia Ltd (AAA). Schiebel sees potential in Australia for its CAMCOPTER S-100 RPAS because of several upcoming programmes. A physical presence through SPL and a partnership with an established Australian company are logical steps in preparing for the opportunities in Australia. The new Schiebel facility puts SPL in close proximity to its customer, the Royal Australian Navy (RAN) at HMAS Albatross and provides direct access to the airfield. It also facilitates cooperation with its new partner, AAA, who is an established provider of equipment and services to the Australian Defence Force. SPL and AAA have agreed to collaborate on the compilation and submission of Request for Tender (RFT) responses for Remotely Piloted Aerial System (RPAS) opportunities in Australia and the Pacific region, as well as the subsequent cooperation in contract delivery,

support and services. Schiebel's CAMCOPTER S-100 is currently under contract for the Australian Navy Minor Project (NMP) 1942. This evaluation programme aims to develop the RAN's understanding of the capabilities of an advanced Vertical Takeoff and Landing (VTOL) UAS. In parallel, the Royal Australian Army has leased the CAMCOPTER S-100 to



Photo: Schiebel

conduct a series of payload evaluations. The Army testing focuses on multiple payloads, including the L3 Wescam.

### Subsea Craft at DSEI

(ck) The UK-based maritime defence technology company, SubSea Craft, will demonstrate its latest surface-submersible Diver Delivery Unit (DDU) at the DSEI trade show in London. The craft will provide armed

forces with a capability to deploy forces at remarkable distances on the surface, at speed, before submerging and continuing to their destination subsurface. In developing the DDU, the manufacturer has been able to secure support from many renowned suppliers. The company is also in dialogue with the Defence Science and Technology Laboratory, the UK's leading government agency in applying science and technology to the UK's defence and security.



Photo: SubSea Craft

### Turkish Aerospace to Cooperate with NLR

(ck) Turkish Aerospace and the Royal Netherlands Aerospace Centre (NLR) have signed a framework agreement on future projects. The two entities will cooperate in the fields of aerospace research projects, training, modelling, simulation, testing and new manufacturing techniques. NLR is a leading international research centre for aerospace. Turkish Aerospace, ranking among the top hundred global players in defence, is Turkey's largest defence and aerospace company.



Photo: TAI

## UK and Sweden Partner on Future Combat Aircraft

(df) The United Kingdom and Sweden will work together to secure their future combat air power. The corresponding Memorandum of Understanding (MoU) was signed by Penny Mordaunt, UK Secretary of Defence, and her Swedish counterpart Peter Hultqvist, which commits both gov-

Photo: BAE SYSTEMS



ernments to work on a joint development and acquisition programme for combat aviation, including the development of new concepts to meet the future needs of both nations. "The UK and Sweden have an enduring defence relationship, with our two industries sharing a rich history of collaboration in air power. Not only do we share the same commitment to tolerance, freedom and free trade, we also share the same determination to defend those values, including in Afghanistan, Iraq and today as part of the UK's Joint Expeditionary Force," Mordaunt said. Hultqvist added that there is a possibility to use advanced technologies for GRIPEN and TYPHOON, the combat aircraft currently operated by Sweden and the UK, before integrating these technologies into a future combat air system. Hultqvist also highlighted the strong industrial base of both countries as central to securing the future Combat Air Force and the existing GRIPEN fighter jet systems. "12 months ago, industry and Government launched a bold and exciting vision for the future for the UK combat air sector on the BAE SYSTEMS stand at the Farnborough International Air Show. This was a vision that was encapsulated by the launch of the UK's combat air strategy and the unveiling of our TEMPEST concept, a glimpse into the future of combat air," said Michael Christie, Director of Future Combat Air Systems - BAE SYSTEMS. "It also marked the launch of the MoD's combat air acquisition programme."

## Competition for Armoured Wheeled Vehicles in Bulgaria

(gwh) The Bulgarian MoD has issued a Request for Proposal (RfP) for the supply of 150 wheeled armoured vehicles. The MoD selected the four European companies ARTEC (Germany), Patria (Finland),

Nexter (France) and General Dynamics Land System – Mowag (Switzerland). The deadline for submitting bids is 31 October 2019. The 150 vehicles are divided into 90 combat vehicles and 60 special and support vehicles, which will be procured in two lots to equip three battalion equivalents. While 8x8 vehicles can be used for the combat vehicles, other drive formulas (6x6, 4x4) can also be offered for the remaining vehicles. It is expected that the companies will offer vehicles already in service with other armed forces. The GTK Boxer armoured transport vehicle (ARTEC) has been introduced in Germany, the Netherlands and Lithuania with over 500 vehicles. A second lot for Germany, an order from Australia and an expected order from the UK might well raise total production well over 1,000 units. The Véhicule Blindé de Combat d'Infanterie (VBCI from Nexter) is launched in France with 630 vehicles. For almost two years now, negotiations have been conducted

Photo: Nexter



on the export of up to 500 VBCi to Qatar. With VBCi 2, a more powerful but heavier version is ready for series production. The Armoured Modular Vehicle (AMV from Patria) with more than 1,700 units is mainly used in Scandinavia and Eastern Europe. At Eurosatory, Patria presented a 6x6 version. The PIRANHA V (GDELS) is the most modern version of the widely used PIRANHA family; Denmark and Romania are currently introducing around 500 vehicles into the troops and Spain is drafting an order for up to 1,200 vehicles. In addition to the vehicles, an automated fire control system for a battery with self-propelled mortars, the associated communication and information systems as well as training and simulation equipment are to be procured. The total cost of the project is estimated at €750M. By involving Bulgarian companies in the production, 20 percent of the added value is to be generated in Bulgaria. An interministerial working group will evaluate the offers and present the results by 20 December 2019. Procurement is scheduled to last over a period of ten years.

## SPIKE Guided Missiles for Estonia

(gwh) Estonia has signed a framework agreement with Eurospike, the joint venture between Diehl Defence, Rheinmetall Defence and Rafael Advanced Defence Systems, for the supply of SPIKE LR anti-tank guided missile systems. The contract has a value of €40M and covers the supply of Integrated Control Launch Units (ICLUs) and missiles with warheads. The Bundeswehr

Photo: Rafael



has launched SPIKE LR with ICLU designated Multi-Role Light Missile System (MELLS). With its shaped charge, MELLS can engage armoured vehicles at distances of up to four km. Data transmission via optical fibre and electro-optical sensors (with infrared detector) enable the operating modes Fire-and-Forget and Fire-and-Observe. Estonia is the 32nd user nation of the SPIKE system and the 19th in EU and NATO. Transnational commonality enables nations to jointly procure SPIKE missiles.

## US Army Procures New M110A1 SDMR Rifle Scope Rifle from HK

(ww) The US Army introduces 5,000 to 6,000 new M110A1 Squad Designated Marksman Rifles (SDMR) for its group-level rifle scope shooters. The US Army

Photo: Heckler & Koch



continues to use the 7.62mm x 51 calibre for its riflescopes. The M110A1 SDMR is a semi-automatic G28E from the G28/HK417 family from Heckler & Koch. The weapons are to be manufactured in Oberndorf and then completely configured by the subsidiary HK USA with the SIG Sauer TANGO 6 1-6x24 SDMR rifle scopes separately procured by the US Army, Geissele assemblies and other



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attachments from a total of 12 companies based in the USA. They will then be delivered to the US Army. Heckler & Koch will also provide spare parts, services and training for the soldiers. The M110A1 will replace the M14 Enhanced Battle Rifle by 2022. The G28E already serves in a different configuration than the M110A1 Compact Semi Automatic Sniper System in the US Army.

## Auto-GCAS Finalised for the F-35

(df) The F-35 Joint Program Office, US Air Force and Lockheed Martin have started integrating the Automatic Ground Collision Avoidance System (Auto-GCAS) with the Air Force F-35As in the fleet. The team was able to field the Auto-GCAS successfully seven years earlier than previously planned. Originally developed for the F-16 in partnership with NASA and the Air Force Research Laboratory, Auto-GCAS uses terrain mapping, geolocation and automation to detect and avoid potential ground collisions. When the programme recognises imminent impact, it will prompt the pilot to take action. If the pilot is unresponsive, Auto-GCAS assumes temporary control to divert the aircraft out of harm's way, and then returns control to the pilot once on a safe trajectory. The system has been operating successfully aboard the F-16 for more than five years and has already been credited with saving eight F-16 pilots' lives since 2014. "This is a great day for the warfighter as the Auto-GCAS is a proven system that is long overdue," said Lt. Gen. Eric Fick, F-35 Program Executive Officer. "Expediting this life-saving technology into the F-35 across the global fleet will bring more warfighters home. Over the service life of the F-35 fleet, having Auto-GCAS is estimated to prevent more than 26 ground collisions from happening. The time and effort expended to deliver this critical warfighting capability is worth it – it will save lives."

## Germany Supports Mali with Protected Vehicles

(gwh) German Ambassador Dietrich Becker officially handed over 29 CASSPIR vehicles to Mali on 16 July 2019. The Ger-

man Government supports the Malian armed forces with armoured vehicles as well as 4,100 protective vests, 4,300 pairs of combat boots and 2,700 combat helmets. Becker announced that another ten CASSPIR will follow this year. The vehicles had undergone a general overhaul before being handed over to Mali. Since 2013, the Bundeswehr has been involved in the EU-led training mission EUTM Mali and is currently one of the major providers of troops. Training of the Malian troops on CASSPIR already began in May 2019. Topics were control of the vehicle in the field, including recovery and wheel change, mounting and dismounting of the gunners, convoy training, first aid as well as self-safety and infantry basics. Since its introduction in 1979, the all-wheel drive 4x4 CASSPIR has been a trendsetter in mine-protected vehicles. Characteristics are the high hull, the V-shaped underbody and the easy reparability. The 2.85 m high vehicle weighs around eleven tonnes and has a ground clearance of 41 centimetres. With a length of 6.9 m and a width of 2.45 m, up to 12 soldiers with equipment can be transported in the protected interior alongside the driver and commander. Powered by a Mercedes-Benz turbo diesel engine with an output of 124 kW, the CASSPIR reaches a speed of 98 km/h on the road. The vehicle can be armed with a 7.62mm MG or a 20mm cannon. The CASSPIR has seen continuous improvements. In order to increase the load capacity, the vehicle was fitted with a third axle. This meant that up to 18 people could be transported. This version was also the basis of the BUFFALO 6x6, which was one of the first MRAP vehicles (Mine Resistant, Ambush Protected) in the US twenty years ago. To neutralise IED from inside the protected cabin, the BUFFALO was equipped with a hydraulically operated crane arm. It spread beyond the US to France, the UK, Italy, Mexico and Canada. The first operations of the Malian security forces with the CASSPIR have been carried out in the troubled region of Mopti for four weeks.

## Contract to Upgrade US AGM-88B

(df) The US Navy has awarded a US\$167M contract for 263 full-rate production Lot 8 Advanced Anti-Radiation Guided Missiles (AARGM) to Alliant Techsystems Operations, a subsidiary of Northrop Grumman. Within this contract existing AGM-88B High Speed Anti-Radiation Missiles will be converted into 260 AGM-88E AARGM all-up-rounds and 3 Cap-

able Air Training Missiles. AGM-88E is a supersonic, medium-range, air-launched tactical missile and – according to the company – compatible with US and allied strike aircraft, including all variants of the F/A-18, TORNADO, EA-18G, F-16, EA-6B, and F-35 (external). The new capabilities of the upgraded missile include: Anti-radar strike with advanced signal processing and vastly improved frequency coverage, detection range and field of view; time-critical, standoff strike with supersonic GPS/INS point-to-point or point-to-MMW-terminal guidance; missile-impact zone control to prevent collateral dam-



age through tightly coupled, Digital Terrain Elevation Database-aided GPS/INS; counter-emitter shutdown through active MMW-radar terminal guidance; and WIA transmission prior-to-impact for bomb damage assessment. Work will be completed in March 2022.

## Poland Modernises its Multirole Fighter Fleet

(mj) The Polish Air Force is about to modernise its combat air fleet, as a number of legacy, Soviet-era platforms are planned to be retired in the nearest future. They will gradually be replaced by modern 5th generation multirole fighter aircraft, which will be procured under the "Harpia" programme. Poland's MoD awaits a response from the US Department of Defense (DoD) to the Letter of Request (LoR), which was submitted on 28 May, in relation to the planned procurement of 32 F-35A LIGHTNING II multirole fighter jets. The positive reaction from the US government will allow the start of formal negotiations, which will set the terms and conditions of the future deal. This will include not only the procurement of new fighters, but also the acquisition of necessary weapon systems as well as training and maintenance equipment. The whole transaction will most likely be finalised through the Foreign Military Sales (FMS) procedure, which means that the US armed forces will partake in the procurement. The Polish MoD expects that new fighter jets will be acquired by 2026, when the current





Photo: U.S. Air Force

Technical Modernisation Plan (TMP) expires. However, some MoD representatives have suggested, that the number of new fighters, which will be procured under the Harpia programme, might increase in the future. Over the past few months the Secretary of State, Wojciech Skurkiewicz, has admitted on numerous occasions that the MoD envisions procurement of another 16 F-35 fighters after 2026. Therefore, the future fleet of Polish 5th generation fighters might increase to 48 to complement the same number of F-16C/D Block 52+ jets that already are in Polish inventory. The planned procurement of 5th generation fighters will speed up the desperately needed modernisation of the Polish Air Force. In

result of the acquisition of F-35s Poland will be able to commence a gradual process of phasing out legacy Su-22 bombers/fighters and MiG-29 fighters. These aircraft no longer meet the requirements of the modern battlefield due to their worsening technical condition and obsolescence of onboard equipment, which in the past few years has led to a number of accidents.

### New Replenishment Fleet Oilers for German Navy

(hum) Following a decision by the German Chief of Defence, the procurement of two new Replenishment (Fleet) Oilers has been launched. They will be available from 2024 on and replace the FGS RHÖN and FGS SPESSART and they are supposed to stay in service well beyond 2050. Thus, the German Navy will meet its specific obligation to NATO in naval logistics: the provision of a total of five "Logistics Ships Small" from 2024 on. The two newly built (designated) Type 707 (German Navy classification) will complement the three combat support



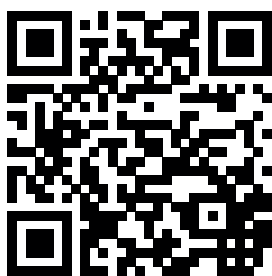
Photo: German Navy

ships (Type 702) of the German Navy. Specialised as Fleet Oilers, they will deliver 15,000 tonnes of fuel, twice as much than the two Type 704 predecessors. In January 2019, personnel from Navy Headquarters (Rostock) joined the German procurement agency BAAINBw in order to hasten the procurement process.

### Germany Sources New Equipment for VJTF 2023

(df) Germany will enter NATO's Spearhead Force (VJTF) 2023 with modernised equipment. Upgrades for the PUMA armoured infantry fighting vehicle and the "IdZ-ES" soldier system will take the German capabilities to a new level. A corresponding contract was signed by the German BAAINBw procurement agency re-

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cently. The modernisation called “System Panzergrenadier” links the PUMA with the modular Future Soldier – Expanded System (IdZ-ES) soldier system in an advanced network-enabled warfare environment. Among other things, the package contains logistic support of the VJTF PUMAs for a period of five years which includes spare parts, special tools and logistics. Also included is a combat performance upgrade of 41 PUMA vehicles and measures for improving communication between the vehicles and dismounted infantrymen. This also includes a new generation of digital radios for the PUMA as well as integration of the MELLs multirole light guided missile system which signifi-

Photo: Rheinmetall



cantly expands the capability spectrum of the PUMA. New daylight and thermal imaging cameras and a colour display are part of the upgrade, too. Optimised day and night vision will increase the range of reconnaissance while widening the crew’s field of view. Furthermore, new training resources will enable the unit to train in a highly realistic manner. The contract for the development of the “Vision Enhancement, Chassis”, which is underway, is linked to the hardware of the new optronic systems and monitors for the infantry fighting vehicles. Main contractor Rheinmetall is equipping the mechanised infantry companies of the VJTF 2023 with its TacNet battle management system (BMS). In addition, an initial lot of ten platoon versions of the “Future Soldier – Expanded System” soldier system will be brought up to modern VJTF 2023 standard. Improved communication between the PUMA crew and the dismounted infantry section will result in a continuously updated operational picture. This way, the mechanised infantry will gain a command-and-control capability that extends from the company commander to the individual rifleman on the ground. Dispensing with the “electronic backbone” is also one key innovation of the new systems. Other features include advanced new radio systems for dismounted troops and infantry fighting vehicles, which result in improved com-

mand capabilities as well as enabling secure transmission of large amounts of data. Furthermore, digitisation of the vision technology will proceed in tandem with the implementation of NATO Generic Vehicle Architecture (NGVA) in the Puma. It forms the foundation for the future sensor-to-shooter nexus. With these new capabilities under contract Germany will be able to enter VJTF 2023 with modern technology and systems, way ahead of the contribution the country made to this year’s VJTF.

## New Software Defined Radios for the German Army

(df) Recent procurements for the VJTF 2023 are making a start on the end-to-end digital command radio link covering the first mile. One of the milestones to digitise the German Army is the procurement of software defined radios (SDR) from Rohde & Schwarz. These SOVERON SDRs will seamlessly connect the PUMA armoured infantry fighting vehicle with the German soldier system IdZ-ES. The SOVERON family works with the high data rate and interference-immune SOVERON WAVE waveforms for tactical use on the first mile, and is thus an exact match for the spectrum of requirements of a battle group for territorial and collective defence as well as for international crisis management op-

Photo: Rohde & Schwarz



erations. The SOVERON WAVE family of waveforms offers mobile ad hoc network (MANet) functionality. Radios equipped with this capability function as routers within the IP network group, forwarding the information via other communication nodes and thus ensuring that a robust, interference-immune link can be maintained under all circumstances. The Rohde & Schwarz VHF/UHF radio systems will establish and maintain the command radio link with simultaneous voice and IP data from dismounted troops up to the platoon and company level. The systems concerned are handheld (SOVERON HR) and vehicular radios (SOVERON VR) that are interoperable with the German armed forces’ joint radio system (SVFuA,

series name: SOVERON D) that has already been commissioned by the Bundeswehr and the SDR waveforms procured with it. SOVERON D also provides backward compatibility with the analog SEM radio infrastructure that will remain in service for some time. A first batch of SOVERON D commissioned for command vehicles will be delivered in the first half of 2020. “This order is a milestone that we have reached after winning against international competitors in challenging trials and comparative tests set by the German Armed Forces (Bundeswehr) in 2018 in Munster, Germany,” said Hartmut Jäschke, Senior Vice President Market Segments Secure Communications Sales and Projects at Rohde & Schwarz. “With our innovative overall approach – SOVERON – we provide national trusted solutions that can be tailored to the customer’s needs but which, due to their open architecture, are compatible with established radio systems and architectures and, at the same time, will be viable in the future.”

## Romanian Corvettes on Hold Again

(hum) A decision made at the beginning of July in favour of the Naval Group has already stalled again. On 8 July, Damen, one of the three candidates, lodged a

Artwork: Damen



complaint with the Romanian National Council for the resolution of complaints and at the same time filed a lawsuit before the Bucharest Court. The Dutch shipyard, which cooperates locally with Damen Shipyards Mangalia (in Mangalia) and Şantierul naval Galaţi (in Galaţi), bases its complaint on irregularities in accordance with the conditions laid down in the tender procedure. Damen points to leaks in information, particularly with regard to pricing. One of the main points of contention is that one of the participants in the tender will not have the corvettes built entirely in Romania and that the on-site installation does not meet the requirements of the tender. In addition, Damen points out that it does not ap-



pear that pricing alone was decisive (as indicated in the presentation of the result). In view of the above, the company considers that it has provided the best solution for the requirements of the Romanian Navy. Damen's offer (€1.25Bn) was only slightly more expensive than Naval Group's (€1.2Bn). In a press release issued by the French MoD on 3 July, it is even stated that Lorient and Toulon-Ollioules have a significant share in the construction programme. It also says that the construction of the platforms and the final assembly will be carried out in technology transfer at Constanta SNC. However, this formulation is open to possible misinterpretation. It seems that there will be another round in the Romanian corvette programme, which is unfortunate, because the Black Sea country needs an efficient navy in view of the growing importance of this critical region for NATO. The modernisation programme has already been postponed several times. As a result, the expected commissioning date of 2022 cannot be met. On the other hand, the government has an interest in modernising the armed forces. There is

a growing danger of losing the political consensus to increase military spending from 2017 to 2% of GDP from 1.4% in previous years. In 2018, military spending was only 1.8% of GDP, mainly due to delayed or frozen modernisation projects.

### New Combat Training Centre for Belgian Army

(df) The Belgian Army will receive a new training centre, with infantry simulators,



Photo: Saab

anti-tank simulators, vehicle systems and communication systems for controlling, monitoring and collecting training data to enable detailed analysis of exercises. A corresponding contract worth €14.9M has been signed by the Belgian MoD and Saab. Deliveries are expected for 2021.

One of the requirements was interoperability with NATO, and with Saab's training system Belgium will be capable of participating in multinational exercises. "This means Belgium will share the same standards as members in the Interoperability User Community (IUC)," explains Åsa Thegström, Head of the business unit Training & Simulation within Saab's business area Dynamics. "They can therefore take part in multinational exercises together with, among others, the Netherlands, Poland, Germany, Austria, Sweden, Norway, Finland, the UK and the US 7th Army." Henrik Vassallo, Head of the country unit France & Benelux within Saab's market area Europe added: "The Belgian Army has used our training systems for the last four years and have clearly seen the benefits of realistic training. This order strengthens our position as one of the world's leading suppliers of solutions for combat training."

### Thales Takes over Steyr Motors

(gwh) The French Thales Group has acquired the insolvent Austrian engine manufacturer Steyr Motors. Following

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the takeover by a Chinese financial investor in 2012, Steyr Motors ran into liquidity problems with the Chinese managing director appointed in 2018 and had initiated restructuring proceedings. Steyr Motors supplies engines for numerous military vehicles. For example, the DURO value maintenance programme in Switzerland came under pressure due to delivery difficulties which is why the Steyr engine was replaced by a Fiat engine. This results in additional costs of around €7M. The Thales 4x4 HAWKEI, of which 1,100 have been built for the Australian armed forces since 2017, has already been equipped with a Steyr engine. By taking over Steyr Motors and its 140 employees, Thales ensures the supply of engines for its vehicles. According to Thales, the order books are fully booked for the next two years.

### Upgrade of the FLYEYE UAS Fleet

(df) The NATO Support and Procurement Agency (NSPA) has signed a contract with WB Group for upgraded versions of the in-service FLYEYE unmanned aerial sys-

tem (UAS). These upgrades include user-friendly solutions to increase the interoperability of the Polish Army by standardising the configuration and replacing the existing equipment with the up-to-date substitutes. FLYEYE is currently used by the Polish armed forces and other services for intelligence, reconnaissance, surveillance and target acquisition (ISTAR) of the battlefield, sensitive areas, national borders, natural disasters or large public events and successfully performs combat missions in symmetric conflicts. It is a modular system characterised by the ease of assembly and disassembly. Launch readiness can be achieved in less than ten minutes. The hand-launched variant can also be operated in tight spaces and confined areas. The enhanced version is characterised by the increased system performance and longer flight endurance, up to 150 minutes. Other new features include a GCS with antenna, the GS4 daylight and IR observation payload and reduced weight for longer time on station. Additional features are the tactical and maritime antennas, the FT-LoC2

GPS-based long range emergency location and recovery device, MIL connectors in the entire system, new backpacks and transportation cases. With the first upgraded sets already delivered to the Polish armed forces for operation, FLYEYE has successfully passed the inspection by NSPA, both in terms of equipment and documentation. Designed to meet the needs of customers, each FLYEYE system is supplemented with two repair kits. In addition, the programme includes delivery of the I-Level repair sets. WB Group will also provide alignment trainings and support for the UAS operators and maintenance on an on-going basis. Delivery is scheduled for the end of 2020.



Photo: WB Group

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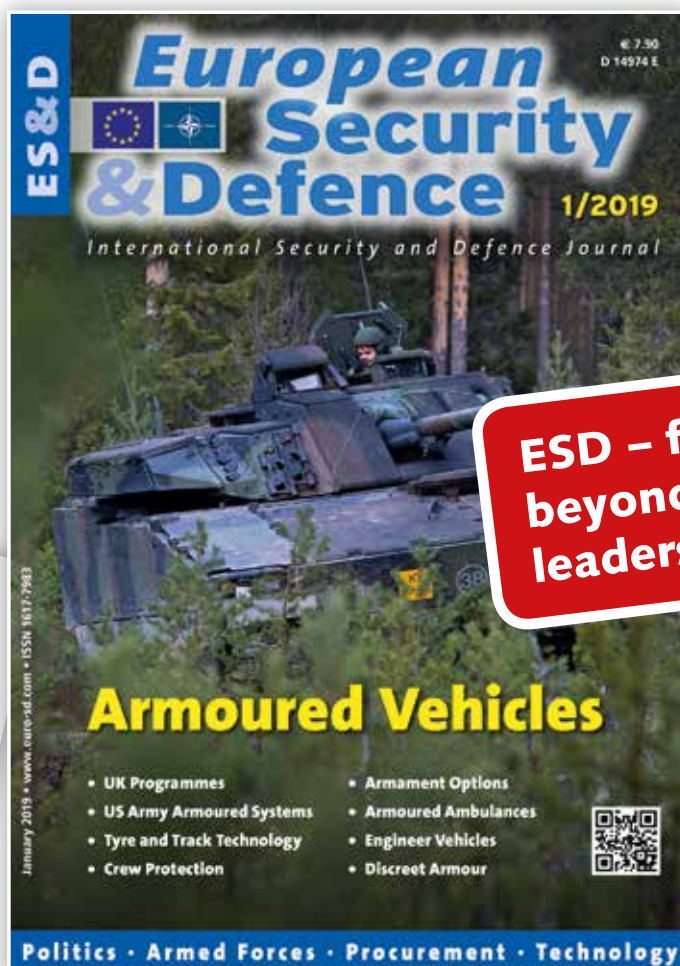
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