

# European Security & Defence

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## Weapons Mix Options Paradigm Shift at the Company Level



### Reaching the Home Base

Maiden voyage of the QUEEN ELIZABETH aircraft carrier



### Heavy Helicopters Reemerge

Germany seeks to replace its ageing fleet. Other countries to follow






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# Putin's Afghan Commitment



Russian President Vladimir Putin has obviously located a new political field of action: Afghanistan. The Russian Government has been particularly interested in Afghanistan of late. Numerous Afghan Government representatives have recently been in talks with various Russian partners in Moscow. But so far, it is still not clear what Russia's real intentions are for Afghanistan. After the USSR invaded Afghanistan in 1979, war broke out, with heavy losses. The war ended in 1989 with the retreat of the Soviet Army, beaten by the Mujahideen, who had been trained by Pakistan with a lot of money from the US. Afghanistan has been regarded as a trauma for the Russian military since then. Russia's policy on Afghanistan was restrained for a long time. But the situation in Afghanistan has not improved, especially since the departure of the combat troops of the ISAF mission, which was conducted as a security and reconstruction mission under NATO leadership in the Afghanistan war from 2001 to 2014, and was continued by the follow-up mission "Resolute Support" with 13,500 soldiers, for educating, advising and training the Afghan security forces. On the contrary: for one thing, experts say, there is massive drug smuggling from Afghanistan, the world's largest producer of opium, to Central Asia. The billion-dollar business is continuing to expand. The UN's "Opium Survey 2016" states that the opium poppy cultivation areas grew by ten percent within one year. A large portion of the drug ends up in Russia. The number of assaults in Afghanistan is growing steadily, and nor is it just the Taliban who are involved, but also fighters from the so-called Islamic State (IS), who, coming from Iraq and Syria, are trying to build a new base in that country. The Russian fear that IS fighters or other jihadists could get to Russia via Central Asia and carry out attacks there is real. "We already know of cases where fighters have set out from Afghanistan," Putin said in an interview. Russia sees IS as a threat to its own country, but especially to its neighbours in Central Asia with high proportions of Muslim population. Russia regards these countries as its natural sphere of influence.

As long as Russia expected that under the new US President Donald Trump no new strategy would be set for Afghanistan, President Putin believed himself to be able to push back American influence there. In a television interview, the Russian President personally admitted that his government had Taliban contacts, even if there were "many radical elements" in the militia. Paradoxically, in the same interview Putin warned of the terrorist threat from Afghanistan. It is a "very dangerous development for all of us" that the Taliban "and other radical Islamists" from Afghanistan are increasingly approaching the borders of the CIS countries, he stated.

On 14 April, Russia issued invitations to a large Afghanistan conference in Moscow to strengthen its influence on further developments in Afghanistan. In addition to experts from Russia and Afghanistan, representatives from China, Iran, India and Pakistan, as well as the five Central Asian ex-Soviet republics took part in the conference. Representatives from NATO countries and the UN were not involved. The US, the Afghan Government's previous protecting power, had refused to participate. The participants called on the radical Islamic Taliban to open peace talks. The Taliban leadership should move away from a violent resolution of the conflict and start negotiations with the government in Kabul. Possible peace talks could take place in Moscow.

The Taliban had so far rejected all offers, and they were not represented at the conference, either. The conference participants also concluded that there was no military solution to the conflict. It could only be resolved by political means, in accordance with the resolutions of the UN Security Council. Russia's real intentions remain unclear even after the conference. What is certain is that there is a desire to limit the influence of the US in Afghanistan. But it is not entirely to be ruled out that Russia is playing a risky double game in Afghanistan by continuing externally to support the official Afghan government, but at the same time arming the Taliban in the background and hoping that the militia will prevent the further spread of IS in Afghanistan.

**Henning Bartels**

## Move Forward More Slowly



Photo: BAE Systems

The current British CHALLENGER 2 main battle tank requires significant upgrade work to allow it to deal with present and future threats **Page 63**

## Setting New Standards



Photo: Kongsberg

Making use of the new generation of anti-ship/land attack missiles requires a complete change in the way navies view Anti-Surface Warfare (ASuW). **Page 76**

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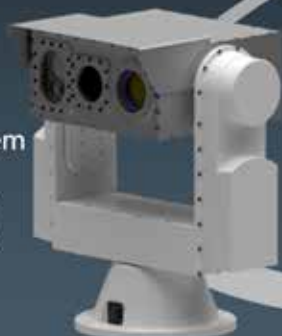
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## ■ Quick-fit EO System for Recce Vehicles

(ck) At DSEi Chess Dynamics will launch the HAWKEYE Vehicle System (VS), a quick-fit electro-optical (EO) system intended for reconnaissance vehicles. HAWKEYE VS is a member of the HAWKEYE family of EO systems. Enabling operators to see out

Photo: Chess Dynamics



to 15km using long-range day/night sensors and infrared cameras, HAWKEYE VS is an easy-to-fit, operator-friendly system. Advanced image stabilisation and video tracker techniques reduce operator workload and enhanced situational awareness aids increase effectiveness. An icon-based display and touch screen, coupled with a 'Game Pad' style controller, make the system intuitive. The ability to designate specific areas for automatic surveillance and alert triggers obviates the need for continual monitoring and reduces the cognitive

burden on the operator. At the heart of the system, a Chess PIRANHA day/low light camera and a Gen4 cooled thermal imager provide long-range surveillance capability. The configuration, featuring a four-metre pneumatic mast on which the sensor head is raised, enables covert surveillance operations at a safe distance and invisible to direct fire weapons. The system also includes a laser rangefinder, an optional laser target marker, designator or near infrared pointer and can be geo-referenced for accurate target location, feeding friendly forces with target information through a battlefield C4I system.

## ■ HENSOLDT Presents Extensive Sensor Portfolio at DSEi 2017

(ck) HENSOLDT has been created by merging the various defence electronics activities of Airbus and develops products for reconnaissance and intelligence. HENSOLDT will present its developments in the area of radar, electronic warfare, and optronics. In the field of IFF, HENSOLDT reveals parts of its Mode 5 equipment which won a €230M contract together with Leonardo from the UK MOD. As "Team Skytale" HENSOLDT and Leonardo will upgrade the IFF equipment of 450 of the UK's aircraft, naval vessels and air defence systems. Also on display will be the ASR, claimed to be the world's most powerful airport surveillance radar; the TRS-4D naval radar system, which is at present being installed on the new frigates for the German Navy and the US Navy Littoral Combat Ship; and the MILDS missile warning sensor, which is an advanced warning sensor for helicopters and wide-body aircraft. The XPELLER counter-UAV system is able

Photo: HENSOLDT



reliably to detect small drones at various distances, thus enhancing protection of critical infrastructure, large events, military installations etc. Also displayed is the Electro-Optical Targeting System EOTS II, with a choice of day vision zoom cameras, including a short-wave infrared (SWIR) option. The driver vision system SPECTUS II features a low light TV camera (LLTV) with a nighttime image quality close to that of a residual light amplifier. The ARGOS-II HD A1 is a multi-sensor system for airborne ISR missions and can be fitted with HD infrared and daylight cameras as well as laser-rangefinders and laser illuminators. LEO-III HD is the new airborne observation system with HD sensors and video outputs setting new standards in law enforcement and paramilitary reconnaissance applications. Also on display is SFERION, a pilot assistance system which protects helicopters in restricted visibility conditions. Hensoldt at DSEi: S6-315, Entrance 7

## ■ 3D Printing Company at DSEi

(ck) A leading rapid prototyping company, Paragon Rapid Technologies, will be showcasing its capabilities to the Aerospace and Defence sector at DSEi. Paragon has worked with influential OEMs in the industry, including BAE Systems, QinetiQ and UI-





tra Electronics. Paragon initiated projects ranging from General Service Respirators and chemical filter systems, to communications equipment, portable lighting and parts for UAVs. With its recent investment in a second high definition large frame SLA machine boasting one of the largest build platforms in the UK, Paragon has become an influential player for 3D print and Additive Manufacturing (AM).  
Paragon at DSEi: Stand S6-190

### ■ Peli-Hardigg Showcases Rugged Customised Protection for Military Equipment at DSEi

(ck) Peli-Hardigg, the world's largest manufacturer of military approved reusable plastic cases, will present its Engineered Cases which can be customised according to customer needs while offering protection for any type of equipment. With more than 500 cases sizes, Peli-Hardigg manufactures reusable cases and containers for storage or expeditions capable of withstanding extreme conditions. Peli-Hardigg cases are lightweight, watertight and heat- and impact- resistant. One of Peli's most important products is the Engineered Case. It offers a customised solution for transportation of any sensitive device regardless its size or weight. Latest features include rotomoulded internal supports with closed cell polyethylene inserts to guarantee protection of fragile military equipment. Peli's V-Series Rack Cases are a pre-configured solution for quick plug and play use. Rack equipment is becoming lighter in weight which requires an economical and rapid method of attachment. V-Series Cases are built utilising a full-boxed 482 mm steel rack with an industry-standard square hole

Photo: Peli-Hardigg



pattern to allow hanging electronics with tab mounts.

In 2017, drones are flooding the market for security and defence: durability, portability and size have become important criteria when choosing a drone. Drones can be fragile devices needing extreme protection and a Peli case may be the solution for transporting drones easily and with complete confidence: the device will arrive intact and fully operational anywhere across the globe. Several Peli cases are custom-designed, although they can be customized for any purpose and to meet any requirement. For example: the ZeroTech DOBBY S\* drone is so small that you can hold it in your hand, and the new Peli Air 1535 case can accommodate it in the landing position with space for extra batteries and accessories. The brand-new Storm case iM2275 fits this drone in travel mode. Parrot's DISCO FPV drone can be conveniently transported in travel mode in the Peli 1610 case, which also offers perfect pro-

tection for the Yuneec's TYPHOON drone, even in the landing position. Many drones can fit in the iM2875 case, especially the likes of the DJI PHANTOM 4, but Peli also offers different basic case formats.

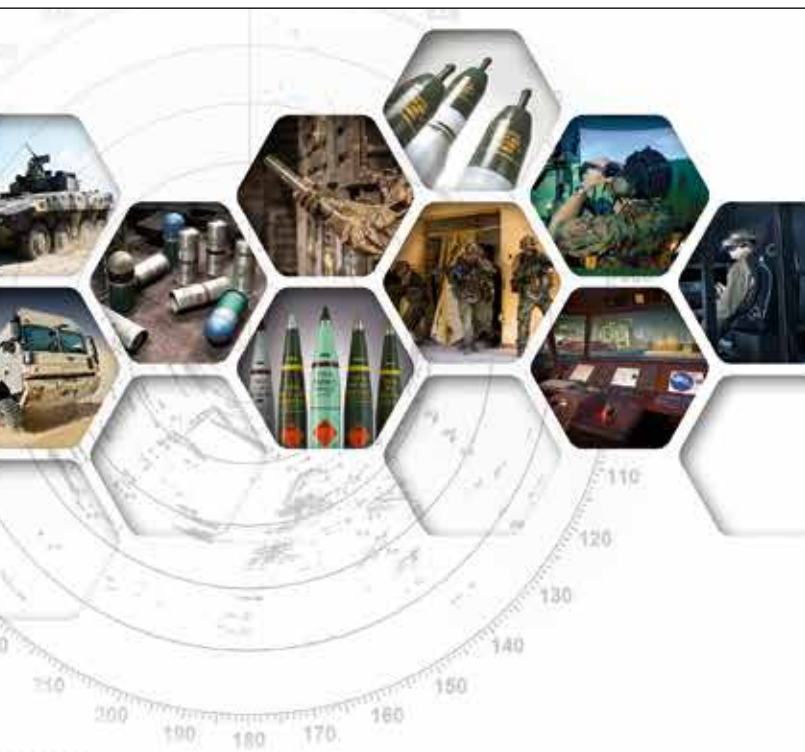
Cube-shaped cases offer more depth and space and some models have a handle and wheels. These cases are watertight, crushproof and dustproof and available in different size options, including the 0340 case (internal dimensions 45.7 cm<sup>3</sup>) which is the perfect fit for the small yet powerful, and very popular DJI MAVIC PRO drone. The 0350 case is slightly bigger, and suitable for drones such as the Walkera VOYAGER 4 quadcopter and Yuneec's TORNADO H920. For bigger drones such as the DJI INSPIRE the 0370 (internally 61 cm<sup>3</sup>) is ideal.

Peli's Long Cases for Larger Systems are oriented more towards the high-end professional markets, such as the military. They are easy for one person to move thanks to wheels and handles, and standard features, as with all Peli cases, include dustproof and watertight seals.

Peli-Hardigg at DSEi: UK Pavilion, Stand S4-240

### ■ Rheinmetall Canada at DSEi

(sb) Rheinmetall Canada will be present at DSEi to introduce the latest evolution of the ARGUS Soldier System. ARGUS has been selected by Canada and is currently being fielded for ISSP. The company recently participated at 2 events in the UK - AWE 17 and the Close Combat Symposium at Shrivenham – in pursuit of additional markets. Also at DSEi, Rheinmetall Canada's Force Protection UGV concept will be introduced, embedding a Rheinmetall Canada QIMEK



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Photo: Rheinmetall Defence



RCWS. Both the ARGUS Soldier System, and the UGV concept will be joined by the company's Site Surveillance and Protection suite of products: the latter will be demonstrated live on the Rheinmetall Defence Booth #57-110

## ■ Finnish Defence Forces Purchase New Tactical Radios

(bk) Bittium and the Finnish Defence Forces have signed a Letter of Intent on the purchase of new software defined radio (SDR)-based tactical radios. The requested radios belong to the new Bittium TOUGH SDR

Photo: Bittium



product family: the Bittium TOUGH SDR Handheld and Bittium TOUGH SDR Vehicular tactical radio systems. The new TOUGH SDR radios can be used to create and share real time situational awareness (location, image, voice, video, and sensor data) to all levels of an organisation. This improves the performance and effectiveness of the troops at the tactical level, and leading the troops is easier and more effective, based on up-to-date situational awareness and more reliable connections.

## ■ TOMAHAWK Cruise Missile Launched from Submarine Payload Tube

(df) The US Navy has test fired two Raytheon-built TOMAHAWK cruise missiles from new submarine payload tubes on the VIRGINIA class USS NORTH DAKOTA (SSN-784) for the first time. The tests proved the submarine's ability to load, carry and vertically launch TOMAHAWK missiles from the new Block III VIRGINIA Payload Tube, the company announced, adding that the up-

graded tubes feature fewer parts and will be even more reliable. In addition to the new payload tubes, the US Navy is also developing a new VIRGINIA Payload Module. "The new modules will triple the number of TOMAHAWK missiles that VIRGINIA class submarines can carry, dramatically increasing each sub's firepower," Raytheon stated. "As the Navy continues to modernise its subs, Raytheon continues to modernise TOMAHAWK, keeping this one-of-a-kind weapon well ahead of the threat," said Mike Jarrett, Raytheon Air Warfare Systems Vice President. "Today's TOMAHAWK is a far cry from its predecessors and tomorrow's missile will feature even more capability, giving our sailors the edge they need for decades to come." The US Navy continues to upgrade the TOMAHAWK Block IV's communications and navigation capabilities, while adding a multi-mode seeker so it can hit high-value moving targets at sea. These modernised TOMAHAWKS are on track to deploy from 2019.

## ■ CHINOOK Block II Upgrade Programme

(df) The US Army has signed a contract with Boeing for the first three test aircraft for the CHINOOK Block II upgrade programme. It is a Block II engineering manufacturing and development (EMD) contract award. "We are bringing several improvements to the

Photo: Boeing



CHINOOK, including a more efficient drivetrain that takes power from the engines to the new advanced CHINOOK rotor blades," said Boeing Director of Sales & Marketing Randy Rotte. "These new blades can lift 1,500 additional pounds on their own, making it that much easier for crews to lift payloads without any adjustments. They can just pick up and go, saving time and effort." Ultimately, 542 CHINOOKs will return to Boeing's Philadelphia facility for Block II upgrades starting in 2018. The series of upgrades will pave the way for the CHINOOK to remain operational through 2060.

## ■ New Vessels Based on STAN PATROL 2606

(df) Damen Shipyards Group announced a partnership with US shipbuilder Metal Shark for the construction of up to 13 Damen SPa 2606 patrol boats. The US Navy recently selected Louisiana-based Metal Shark to build Near Coastal Patrol Vessels (NCPVs)

Photo: Damen



for United States partner nations through the Department of Defense Foreign Military Sales (FMS) programme. The new vessels are based on Damen's STAN PATROL 2606 Foreign Military Sale (FMS) design, which will be tailored by Metal Shark to suit the requirements of the NCPV mission. The cutter can carry out a wide range of mission profiles including search and rescue, border patrol, police and customs duties, counter-narcotics operations, and securing waters of economic importance. Under the terms of the contract Metal Shark will build up to 13 of the 85-foot DEFIANT class welded aluminium cutters for the Dominican Republic, El Salvador, Honduras, Costa Rica, Guatemala and other United States partner nations. Additionally, Metal Shark will supply electro-optical infrared sensors, diagnostic equipment, in-country reactivation, crew familiarisation and test support to NCPV operators.

## ■ Autonomous Flying Systems

(df) The US Defense Advanced Research Projects Agency (DARPA) has announced that several in a milestone series of tests with quadcopters slaloming through woodlands, swerving around obstacles in a hangar, and reporting back to their starting point all by themselves have been successfully accomplished. "Phase 1 of DARPA's Fast Lightweight Autonomy (FLA) programme concluded recently following a series of obstacle-course flight tests in central Florida," DARPA announced. Over four days, three teams send their unmanned systems through increasingly difficult runs. "DARPA's FLA programme is advancing technology to enable small unmanned quadcopters to fly autonomously through cluttered buildings and obstacle-strewn environments at fast speeds (up to 20 me-



tres per second, or 45 mph) using onboard cameras and sensors as 'eyes' and smart algorithms to self-navigate," the agency says about the goal of the programme. "The FLA programme is focused on developing a new class of algorithms that enables UAVs to operate in GPS-denied or GPS-unavailable environments — like indoors, underground, or intentionally jammed — without a human operator. Under the FLA programme, the only human input required is the target or objective for the UAV to seek — which could be in the form of a digital photograph uploaded to the onboard



Photo: DARPA

computer before flight — as well as the estimated direction and distance to the target. A basic map or satellite picture of the area, if available, could also be uploaded. After the operator gives the launch command, the vehicle must navigate its way to the objective with no other knowledge of the terrain or environment, autonomously manoeuvring around uncharted obstacles in its way and finding alternative pathways as needed."

### ■ MUSS Self-Protection Equipment

(bk) HENSOLDT is delivering 350 MUSS (MULTifunctional Self-protection System) equipment sets to be installed in the new PUMA infantry fighting vehicle of the German Army. The 200th equipment set has just been distributed. Each MUSS equipment set contains four warning sensors, a central unit, an infrared jammer head,



Photo: PSM

jammer electronics and a novel, pointable smoke grenade launcher. It is an operational soft-kill active protection system, which defeats any threat before it is able to reach and destroy the vehicle: MUSS senses the threat and provides a "soft" response based on jamming or obscuration of the guidance mechanism; the "soft" response also decreases the risk of collateral damage.

### ■ WiSPR for the BOXER

(bk) The well-known specialist electronics house INTRACOM Defense Electronics (IDE) of Athens, Greece will equip the BOXER Infantry Fighting Vehicle for the international market - for example, Lithuania - with its



Photo: INTRACOM

Wideband Intercom and Secure Packet Radio (WiSPR) intercommunications system. WiSPR is a software defined intercommunications system for military vehicles, offering communication under extreme conditions. Featuring a versatile system architecture, adjustable to meet a variety of operational requirements of the modern digital battlefield, deliveries of WiSPR for BOXER are scheduled to be completed in 2018.

### ■ Verification of LEGUAN

(bk) Krauss-Maffei Wegmann (KMW) has delivered the first demonstrator system of the new LEGUAN armoured vehicle launched bridge (AVLB) module to the German Army at the training centre for combat engineers (AusbZPi) in Ingolstadt. The Federal Office of Bundeswehr



Photo: KMW

Equipment, Information Technology and In-Service Support (BAAINBw), the troops and the manufacturer will test and verify the system. During these tests the various functions required for operational success will be tested under real conditions. The industry accompanies the testing to remedy any deficiencies and to gain important knowledge for the production run. After a successful verification process authorisation for the operational use of the LEGUAN will be given. The German Army bought seven LEGUAN bridge module systems in October 2016, which will be delivered between 2018 and 2021.

### ■ Italy's Military Space Observation Launched

(df) The Italian Ministry of Defence's OPT-SAT-3000 satellite has been successfully launched by Arianespace from the Kourou European spaceport in French Guyana. OPTSAT-3000 consists of a satellite in a sun-synchronous Low Earth Orbit (LEO) and of a Ground Segment for in-orbit control and for data acquisition and processing.

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The system will provide high-resolution images of any part of the globe, giving Italy an autonomous national capability of Earth observation from space with a high-resolution optical sensor. Following the successful launch, system check and test activities have started; the system will subsequently



Photo: Leonardo

be entirely managed by the Italian ground segment, located over three operations centres: the Joint Satellite Remote Survey Centre (CITS – Centro Interforze di Telerilevamento Satellitare); the SICRAL Joint Management and Control Centre (CIGC – Centro Interforze di Gestione e Controllo); and the Fucino (L'Aquila) Space Centre of Telespazio. OPTSAT-3000 will jointly operate with the second-generation COSMO-SkyMed system of radar satellites integrating optical and radar data to provide the Italian Ministry of Defence with information characterised by extreme accuracy, resolution and completeness and with state-of-the-art analysis and operational tools.

## ■ Advanced Battery Charger from Bren-Tronics

(sb) When Bren-Tronics first introduced lithium ion electrochemistry for military batteries back in 1995, the problem of charging and re-charging arose: lithium ion requires a strictly controlled charging. Instead of designing one charger per battery type, or upon customer demand, Bren-Tronics took the lead in designing chargers according to operational usage (vehicle-mounted, soldier-portable, and maintenance) and not by battery type. The same charger supports all types of chemistry (NiCad, NiMh, Li-Ion), battery voltage and form factor. New charging profiles can be downloaded for charging capability evolution. Today, more than 70 different types of military battery packs are supported by Bren-Tronics Universal Chargers. Decades after the first universal charger, in September 2016, the USMC awarded Bren-Tronics the contract for the Advanced Battery Charger (ABC) programme, which is the next generation

of Military-Grade battery chargers. The Bren-Tronics ABC is a portable battery charging system that offers next-generation improvements in size, weight and efficiency, while providing selectable power, faster charging times, increased environmental survivability, and other significant innovations. The charger is designed to charge quickly and efficiently current and future-format military and commercial batteries used on communications, electronics, robots and other tactical platforms. Battery charging capabilities include, but are not limited to: BB-2590/U, BB-390B/U,



Photo: Bren-Tronics

BB-2557/U, Conformal Wearable Battery (CWB) and many others. The charger will accept multiple power inputs including universal AC, wide range DC, power from solar panels, fuel cells, wind turbines, etc. The company's main concerns have always been safety, reliability and performance. Safety is controlled by the internal battery management system, monitoring and balancing each cell in charge and discharge modes to prevent any internal electrical abuse. It is also guaranteed thanks to the state-of-the-art lithium-ion charging profile CCCV (Constant Current – Constant Voltage) integrated on all universal chargers. With these new generation chargers, Bren-Tronics continues to lead the way in cutting-edge operational improvements to power the modern war fighter!

## ■ Tests of the Long Range Anti-Ship Missile

(df) Lockheed Martin has announced it has successfully conducted the first-ever launch of the surface-launch variant of the Long Range Anti-Ship Missile (LRASM) from a topside canister. The flight test proved the missile's ability to conduct an angled launch from the newly designed topside canister, replicating a ship-launched environment. During the test, the LRASM, its Mk-114 booster and booster adapter ejected cleanly from the topside launcher using the same launch control and launch sequencer software currently employed by the Mk-41 Vertical Launch System (VLS).

"This successful flight test demonstrates Lockheed Martin's readiness to answer the US Navy's call for lethal, longer range anti-



Artwork: Lockheed Martin

surface warfare capabilities as part of the 'Distributed Lethality' concept," said Scott Callaway, Subsonic Cruise Missile director at Lockheed Martin Missiles and Fire Control. "This test also validates the flexibility and versatility of LRASM, as it proved it can be successfully fired from VLS and non-VLS surface platforms."

## ■ Phase Four of MAPLE Project

(df) Another important step in the British MAPLE project, a project seeking to demonstrate and de-risk the integration of multiple unmanned systems into the combat system of a Royal Navy warship, has been taken. QinetiQ has signed a GBP4.5M contract to lead phase four of the Maritime Autonomous Platform Exploitation (MAPLE) project for the Defence Science and Tech-



Photo: QinetiQ

nology Laboratory (Dstl). MAPLE is lead by QinetiQ in partnership with BAE Systems, SeeByte and Thales. In MAPLE phase three, the companies led the development and build of a technology demonstrator called Autonomous Control Exploitation Realisation (ACER), a deployable prototype which is based on Dstl's Open Architecture Combat System (OACS). ACER provides the means by which the output of MAPLE can be effectively demonstrated in a variety of situations. Phase four will continue to evolve this design, validate its architecture and extend it to include communications. The project will build on the success of Unmanned Warrior 2016 with the successful integration of data sourced from 25 unmanned air, surface and underwater vehicles from 12 organisations through ACER.



"MAPLE is a key project in unlocking the huge potential of unmanned vehicles and autonomous systems in safeguarding sovereign interests," said Stuart Hider, QinetiQ's Director Maritime Programmes.

#### ■ Lincad Develops Expertise in Transporting Lithium-Ion Batteries

(SB) Lincad, a UK-based leader in the design and manufacture of bespoke batteries, chargers and power management systems, has taken further measures to ensure that it can continue to transport its industry-leading lithium-ion products to customers, across the world, safely and in full accordance with the latest IATA (International Air Transport Association) regulations. Lincad has its own DGSA (Dangerous Goods Safety Advisor) trained in the transport of dangerous goods, other staff specifically trained in the transport of lithium and lithium-ion batteries by air, and has three qualified ADR (Accord Dangereux Routier) drivers. Lincad continues to progressively train its team to the highest standards in battery transportation and has recently employed ten new members of staff at its HQ. Peter Slade, Joint Managing Director, recently

completed the Lithium Battery Course for Air and comments "We take the safe transportation of our products to our customers very seriously. With growing demand from our customers, we have made significant investments in expanding our team and enhancing their qualifications. We have the skills and expertise to transfer our lithium-ion products by all modes of transport with the absolute minimum of risk, and are now seen as knowledge leaders in this area." Lincad's Lithium-Ion Power System (LIPS) range of batteries represents over 15 years of evolution in battery technology and design, with the first LIPS battery being produced in 2000. Continued improvements in capacity and energy density have been enabled through the integration of new cell technology, and enhanced mechanical and electronic design. Lincad's Caravel Mk2 Charger, a cutting-edge product offering multi-chemistry charging of batteries from any OEM, has in-built functionality that enables it to discharge lithium-ion batteries to meet the 30% state of charge transportation limit. It also offers functionality to allow discharge of batteries to a state of charge level most suitable for long-term battery storage.

#### ■ CBRN Centre Covering a Complete Country

(df) Saab, in cooperation with the Kuwaiti partner Bader Sultan & Bros, has delivered the world's first integrated national CBRN (Chemical, Biological, Radiological and Nuclear) centre, which is now operational in Kuwait. This CBRN centre is the first to cover a whole country with fixed and mo-



bile CBRN sensors and units, whilst also providing simulated training. During 2015 Saab delivered the AWR (Automatic Warning and Reporting) system for the Kuwait National Guard. AWR is a flexible, modular and future-proof solution for the detection, identification, warning, monitoring and reporting of CBRN hazards. The system can be operated from fixed locations or in the

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move, carried by personnel or mounted on vehicles. It is a key part of the national CBRN centre. "The Kuwait National Guard is proud to both lead the way and protect the Kuwaiti people with our new national CBRN capability", says General Hashim Al-Refaae, Undersecretary for the Kuwait National Guard.

## ■ Bluetooth-Enabled Sensors for Military Bridging Systems

(df) BAE Systems has developed Bluetooth-enabled sensors to monitor the "health" of military bridging systems. This new "fatigue monitoring" technology continuously detects the stress and strain on bridges designed to be used by tanks weighing many tonnes. The sensors used to monitor the bridge wirelessly transmit data to a handheld device, allowing soldiers to easily assess the health of the bridge. "Without the use of an automated fatigue monitoring system, the remaining service life of rapidly deployable military bridges is based on manual records and is difficult to judge, resulting in bridges being retired early or overused. The new technology uses a series of sensors fitted to the bridge components which undergo the most strain, and records around a hundred strain readings per second", the company announced. "Computer analysis then gives a component-by-component overview of bridge health. BAE Systems' use of fatigue monitoring technology gives military engineers the peace of mind that their bridges remain healthy, even on extended military campaigns where bridges can remain in place for many months." BAE Systems designed and manufactured the British Army's rapidly deployable military bridging system BR90 in the 1990s. BR90 comprises 74 bridging systems and can be used in a variety of configurations, adding up to a total of 8.5 km of bridge trackway. The company states that it provides the most rapidly deployed and flexible gap crossing capability in the world: variants can be used to span gaps greater than 60 metres.

## ■ Airbus Helicopters and IAR to Extend Partnership on H215M

(ck) In the presence of French President Emmanuel Macron and Romanian President Klaus Iohannis Airbus Helicopters and IAR signed an agreement. IAR is Romania's leading aerospace company. Under this 15-year agreement Airbus and IAR will extend their cooperation on the H215M multirole helicopter. IAR will become the prime contractor for the H215M for any future order by the Romanian Ministry of Defence to replace

their ageing fleet. The agreement underlines the commitment of Airbus Helicopters and IAR to contribute to the modernisation of

Photo: Airbus Helicopters



the Romanian armed forces fleet of multirole helicopters in the long term. Under this agreement, IAR will act as prime contractor for all future H215M orders that could be placed by the Romanian Ministry of Defence. The agreement also covers cooperation between Airbus Helicopters and IAR on the production, assembly, customisation, support and maintenance of the H215M helicopters destined to the Romanian Armed Forces, and export if opportunities arise.

## ■ Turkey to Open Competition for ALTAY Tank Contest

(ck) In an ongoing effort to rejuvenate its armoured equipment, Turkey's procurement authorities just sent a request for proposals (RFP) to three Turkish armoured vehicles manufacturers, as part of the ALTAY tank programme. In effect, this decision means the three companies will be invited to bid on the programme, estimated to reach beyond US\$10Bn. The Undersecretariat for Defence Industries (SSM) sent the RFP to the companies BMC, Otokar and FNSS. All three companies are privately owned. In June, SSM scrapped negotiations with Otokar for the ALTAY programme. Otokar is Turkey's largest privately owned defence company and the developer of prototypes of the ALTAY, Turkey's first indigenous battle tank. In 2008, Otokar had signed a US\$500M contract with SSM for the development and production of four ALTAY prototypes. The Altay contract involves the serial production of an initial batch of 250 Altay tanks. Turkey intends to manufacture a total of 1,000 tanks. Earlier this year, Otokar's ALTAY prototypes successfully completed qualification tests including mobility and endurance testing on rough terrain and climatic conditions, firing tests with various scenarios, and sur-

Photo: Otokar



vivability testing. In June 2017, the Turkish state cancelled its contract with Otokar and decided to go for competition.

## ■ Jordan Light Vehicle Manufacturing (JLVM) at DSEI

(sb) JLVM will be displaying models of AL JAWAD's fourth generation vehicle and AL WAHSH, which are the newest editions of its armoured internal security vehicles (ISV) at DSEI. AL-JAWAD MKIV comes as a continuation of the previous, renowned and successful AL-JAWAD models. AL-JAWAD is an Armoured Vehicle designed to protect occupants from high levels of ballistic and fragmentation as standard with CEN B6 level of protection. Built on heavy duty chassis with a 6.7L Diesel Turbo Engine producing 300 HP, AL-JAWAD guarantees high automotive performance & manoeuvring, adequate payload and considerable tactical capabilities. AL-JAWAD is designed with battle dynamics in mind, and flexibility to get into action inside cities and narrow roads with easy manoeuvring. As a troop carrier its capacity is 2+8 fully equipped troopers. AL-WAHSH is a special purpose armoured vehicle designed and developed to meet modern warfare mission requirements and to operate in all kinds of terrain. It is designed for troop transportation along with their tactical gear. AL WAHSH is built on a TATRA chassis and is capable of carrying up to 10 crewmembers while providing STANAG 4569 KE L1 and STANAG 4569 KE L2 protection.

JLVM at DSEI 2017: Stand N9-310 (KIG)

## ■ KADDB Investment Group (KIG)

(sb) KADDB Investment Group (KIG) and its affiliates will be participating for the 7th consecutive time at DSEI. During the event KIG's affiliates will display a number of their newest and most unique products. KADDB Investment Group (KIG) was established to act as the commercial arm for King Abdullah II Design and Development Bureau (KADDB). With its innovative yet reliable solutions, KIG has proven itself to be a world-class and trusted provider for defence products to over 35 countries across the Middle East, Europe, the Americas, and Southeast and Central Asia. The Group provides a wide array of products for defence requirements, with solutions for Armoured and Special-Purpose Vehicles, Personal Protection products, state-of-the-art Metal Forming technologies, Turrets and Ring Mounts, Night Vision and Thermal Imaging Systems, Ammunition, and Combat Supplies (MRES). KIG at DSEI 2017: Stand N9-310



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	FRAME	GRIPS	TRIGGER	SIGHTS	OVERALL LENGTH (MM)	BARREL LENGTH (MM)	HEIGHT (MM)	WIDTH (MM)	WEIGHT (G)	SAFETY FEATURES
CZ P-10 C	POLYMER	-	STRIKER FIRED DOUBLE ACTION	LUMINESCENT OR TRITIUM	187	102	132	32,2	760	TRIGGER SAFETY; DROP SAFETY # 1 STRIKER BLOCK; DROP SAFETY # 2 TRIGGER BAR SAFETY
CZ P-10 C FDE	POLYMER	-	STRIKER FIRED DOUBLE ACTION	TRITIUM	187	102	132	32,2	760	TRIGGER SAFETY; DROP SAFETY # 1 STRIKER BLOCK; DROP SAFETY # 2 TRIGGER BAR SAFETY

Stated dimensions may be different in particular design and configuration.



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9x19

30

9x21

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- › EXTREMELY TOLERANT FOR AMMUNITION QUALITY

	CALIBRE	MAGAZINE CAPACITY	FRAME	BARREL LENGTH (MM)	OVERALL LENGTH (MM) WITH FOLDED/UNFOLDED/ EXTENDED STOCK	HEIGHT WITHOUT MAGAZINE (MM)	WIDTH (MM) WITH FOLDED /UNFOLDED STOCK	WEIGHT WITHOUT MAGAZINE (G)
CZ SCORPION EVO 3 A1	9x19 9x21	30 30	POLYMER	196	420/625-675±10	215±5	60/82±5	2607±50

Stated dimensions may be different in particular design and configuration.

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- AMBIDEXTROUS CONTROLS FOR OUTSTANDING ERGONOMICS
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	CALIBER	MAGAZINE CAPACITY	FRAME	BARREL LENGTH (MM)	LENGTH OF WEAPON WITH STOCK FOLDED/UNFOLDED, RETRACTED -EXTENDED (MM)	HEIGHT WITHOUT MAGAZINE (MM)	WIDTH OF WEAPON WITH STOCK FOLDED/ UNFOLDED (MM)	WEIGHT WITHOUT MAGAZINE (G)
CZ BREN 2 8"	5.56x45 mm NATO	30	ALUMINIUM	207	505/684-733 ± 10	202 ± 5	80/104 ± 5	2891 ± 50
CZ BREN 2 11"	5.56x45 mm NATO	30	ALUMINIUM	280	577/762-807 ± 10	202 ± 5	80/104 ± 5	2986 ± 50
CZ BREN 2 14"	5.56x45 mm NATO	30	ALUMINIUM	357	657/840-884 ± 10	202 ± 5	80/104 ± 5	3103 ± 50
CZ BREN 2 9"	7.62x39 mm	30	ALUMINIUM	227	525/706-753 ± 10	202 ± 5	80/104 ± 5	2847 ± 50
CZ BREN 2 11"	7.62x39 mm	30	ALUMINIUM	280	573/755-802 ± 10	202 ± 5	80/104 ± 5	2896 ± 50
CZ BREN 2 14"	7.62x39 mm	30	ALUMINIUM	357	650/833-880 ± 10	202 ± 5	80/104 ± 5	3009 ± 50

Stated dimensions may be different in particular design and configuration.



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# Italy and its Defence Partnership with NATO and the EU

Luca Peruzzi

**Increasing worldwide instability and participation in the defence of NATO and EU borders against terrorism and other non-conventional threats pushed Italy to review its defence capabilities and structure towards a smaller but more efficient “instrument” in a period of budget contraction.**

Italy's security and defence policy has registered important development in the last years, starting from the Armed Forces' continued and broad engagement in crisis management operations in the Euro-Mediterranean region, and the participation in the framework of international community operations aimed at countering the so-called Islamic State in Iraq, after the shifting of resources from Afghanistan, where NATO has reduced its military presence. In parallel, the political efforts of the Italian Government were oriented towards increasing NATO and EU attention to the security of the Mediterranean region, a commitment which culminated with the NATO decision last February to establish within the “Framework for the South” initiative an “Hub for the South” to coordinate and implement all the security-related courses of actions in that area.

## The New “White Paper for International Security and Defence”

In the meantime, the Italian Government, especially the Minister of Defence Roberta Pinotti, has worked since 2014 to provide a document guiding the orientation and evolution of the military over the medium term, of which the last significant proof for Italy dates back to 1986. The “White Paper for International Security and Defence” indicating the political-strategic view on the development of the military and its use to Italian foreign and defence policy ends, was published on April 2015 after the guidelines were presented in June 2014. The White Paper was latterly submitted to the Supreme Defence Council and then to Government and Parliament. In February this year, the Government approved a law bill and presented it to the Parliament for approval, in order to implement the transformation indicated in the White Paper regarding the “Governance”

Photo: NATO



*Bilateral meeting between NATO Secretary General Jens Stoltenberg and the President of the Italian Republic, Sergio Mattarella*

and the “Military Instrument”, which will be discussed later.

The main innovation introduced by this new White Paper regards the geographical areas where Italian Armed Forces will be employed in the future. In addition to the defence and security of national borders and territory, the White Paper indicates the Euro-Atlantic and Euro-Mediterranean areas, the vital ones for protecting the national strategic interests. The new programmatic document also specifies the contribution to and participation in crisis management and stability operations outside these priority areas of intervention, as well as the participation in civil protection operations. Besides the contribution to the collective defence of the Atlantic Alliance and Europe, the promotion in the latter case as well as the push for increased integration of resources and capabilities between members' countries, the White Paper establishes

the Euro-Mediterranean zone as the principal area of national intervention. “Gaining an elevated level of stability and democratic development in the countries that weigh on the Mediterranean basin, represents the priority objective of our country,” the document, foreseeing deeper military cooperation with nations of this zone.

## Italy's Operations for NATO

In the last years, Italian Government and Ministry of Defence (MoD) continued to support NATO on both the Eastern and Southern Europe borders, without relinquishing its responsibilities on both areas. After NATO's International Security Assistance Force (ISAF) conclusion in 2015, and its replacement with Resolute Support Mission, Italy has maintained a strong commitment in Afghanistan, being the largest European contributor together with Ger-

many. Italian Armed Forces are continuing their missions in Lebanon, where Italy maintained the command since 2007 to date, as well as in Kosovo, in the Horn of Africa and on the NATO South-Eastern Flank, with an air defence asset (SAMP/T) deployed in Turkey. Italian Armed Forces are involved in the Prima Parthica/Inherent Resolve missions with Intelligence, Surveillance and Reconnaissance (ISR) air operations taking off from Kuwait as well as on the ground to support Iraqi and Kurdish allies with instructors, military advisors and Special Forces. This is due to the fact that the Italian Government decided to redirect its military engagement abroad toward the Mediterranean region, in response to the factors in the area's growing instability, ranging from the migration to the advance of the so-called Islamic State.

Photo: Garibaldi Brigade



**Iveco LMV of Italy's Brigata Bersaglieri Garibaldi manoeuvring through the Hohenfels (Germany) training area during Exercise ALLIED SPIRIT**

Photo: Italian Army



**The ARIETE main battle tank has been in service with the Italian Army since 1995.**

During the years of independent operations in the Mediterranean area, the Italian MoD carried out the Mare Nostrum mission between October 2013 and October 2014, one of the largest rescue but also maritime security operations in the region headed by the Italian Navy. The latter today is involved in the Mare Sicuro national mission while contributing to NATO's new Sea Guardian operation in the same region. The evolving migration crisis pushed the EU to establish the EUNAVFOR MED – later renamed Sophia – mission within the EU's Common Security and Defence Policy (CSDP). Italy is in command of the mission, which entered "phase 2" in October 2015, that allows vessels to be stopped, inspected and seized and allows suspected traffickers to be arrested. In the meantime, the Italian Government is putting all its efforts into establishing a NATO strategy for the South-eastern Flank while facing the overarching com-

mitment to Libya with a view to pursuing an effective "whole-of-government approach" in solving the crisis in the country, and the deployment of a contingent providing medical support to fight DAESH local forces.

In February 2017, NATO agreed to create a regional Hub, based at NATO's Joint Force Command in Naples. The Hub will assess and address threats from the Middle East and North Africa, collecting information to improve situational awareness and to coordinate efforts and activities. The Italian MoD has also offered the NATO NRDC-IT command for potential operations in the region as well as a divisional command to coordinate the support activities (DCB, Defence Capacity Building) in favour of local Middle East and North African countries.

## Vehicles of the Italian Armed Forces

The experience gained in these years in the theatre of operations has pushed the Italian MoD to develop capabilities which have already been integrated in both NATO and EU defence organisations. Otherwise, they are offered based on binational or multinational agreements. Within the European Air Group (EAG) framework, Italy has hosted and directed the European Personnel Recovery Centre (EPRC) since July 2015. In the same period, the Italian Air Force received the first aircraft of a fleet of 12 Leonardo AW-101 helicopters specially configured for Combat SAR and Special Forces support, making one of the most

advanced platforms available at NATO and EU level. Further to this, the European Air Transport Command took operational authority of the Air Force's fleet of transport and air-refuelling on January 2016 under the "pool & sharing concept". The Italian Air Force has certified an advanced training syllabus for 4th/5th generation frontline pilots, which includes Leonardo's M-346 advanced trainer and lead-in fighter and its ground-based training system and from 2019 the new M-345 basic trainer. The system has attracted the interest of foreign Air Forces with more than 50 international military pilots from nine different countries currently in training, making it a proven solution for potential European or NATO joint-training efforts.

The same service has recently received the first of two GULFSTREAM G550 CAEW (Conformal Airborne Early Warning) platforms from Israeli company Elta, to conduct airborne early warning as well as command and control in addition to persistent ISR missions, together with the General Atomics PREDATOR A/B. Italy is the first UAS customer in Europe. The Italian Navy education and training centres are involved in the certification of the Algerian Navy's crew personnel, a successful solution which recently saw Qatar Emiri Naval Forces request a larger training package for the crews of ships, to be built by Fincantieri, under acquisition for its renewal and expansion fleet program. Thanks to its participation in worldwide operations and the training/advisory package provided to allied, friend and third nations, the Italian



Army has recently established the NATO Centre of Excellence (COE) for the Security Force Assistance (SFA), which adds to the one (COESPU) for stability police units held by the Carabinieri.

Photo: US Navy

## Newly Structured Ministry of Defence

After the unveiling of the new “White Paper for International Security and Defence 2015” by Minister of Defence Roberta Pinotti in April 2015, the Italian Government has recently submitted a law bill to the Parliament to sustain current and future initiatives at a national and international level. If approved, it will implement the transformation indicated in the White Paper with a separation between political and military direction, starting from the reform of the MoD’s top structure and new attributions to the Minister of Defence and Defence Chief-of-Staff.

This law bill provides more power and autonomy to the Minister of Defence and reinforces the offices of direct contribution to his office. The new Chief of Defence (CHOD) will remain the head of the military-technical office in Defence Administration. In terms of political authority, he will be solely respon-



**The GIUSEPPE GARIBALDI aircraft carrier was the first Italian ship built to operate fixed-wing aircraft.**

sible for all aspects related to recruitment, preparation, tasking, general support, and logistics of the armed forces. The CHOD will ensure the employment of forces, the support of the forces as well as the generation and preparation of the forces. To accomplish “the employment of the forces”, the CHOD

will have a Vice Commander for Operations (VCOM-OPS), to whom the responsibility for the operational planning and for tasking forces in the theatre will be delegated. He will be the head of a Joint Operational Command, and of the existing Army, Air Force and Navy’s operational commands, as well

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**ALENIA C-27J SPARTAN transport aircraft operated by RSV/311 Gruppo, Italian Air Force**



**Soldiers from Italy, Spain, Poland and Canada observing a capabilities demonstration at Adazi military base in Latvia**

as the Joint Special Operations Command and the future Cybernetic Operations Command. Any type of operation therefore will come under the responsibility of the Joint Operational Command. The Chief of Staff of the Armed Forces will respond to the CHOD and will, on the basis of the directives received, take responsibility for the generation and preparation of the Land, Air and Naval Forces.

The new figure of the National Armaments and Logistics Director (DNAL) will centralise the acquisition of weapon systems, infrastructures and logistics, except for the direct support to the operational units. The new DNAL figure, who could be military or civilian, will head a two divisions structure including the National Armaments Directorate and the Defence Logistic Command. The technical-administrative functions, with the exception of

those associated with the activities under the CHOD, will be reordered within the General Defence Secretariat, whose management will be entrusted to a civilian, who ultimately will respond to the Ministry of Defence. The law bill also indicates the establishment of a Command for the joint forces education and also of a centre of high education and research.

The second part of the law bill includes the delegation to the Government to issue all the directives to implement all the actions required by the Strategic Defence Review, which is indicated in the White Paper and already identified by the Defence Chief of Staff. This includes every pooling, structure cuts and rationalisation, as well as the decrease of the Armed Forces and civilian personnel, the personnel age reduction and the introduction of a professional model where the "military profession" cannot

constitute the entire working life for every member of the Armed Forces. The personnel requirements will follow the current reduction process: from 190,000 soldiers and 30,000 civilian employees to, respectively, 150,000 and 20,000 units by 2024. The Ministry of Defence will track the target for a younger, slimmer and flexible personnel structure, with more modern recruitment criteria and career progression. Moreover, to mitigate the possible risks linked to a reduced force structure, the creation of a Reserve Force is part of the review. Italian Armed Forces' personnel expenses today require more than 70% of the Defence Function Budget, leaving only the remaining resources for operations, maintenance and procurement. To move towards a more balanced 50%-25%-25% ratio, as well as to increase the limited period voluntary service in order to reduce the average age, long-term investments and incentives with funding stability are required. The approval of the law bill will depend on the longevity of the current Parliament legislature.

## Conclusion

The "Strategic Defence Review" will open the way to a document of a new programmatic 15-year general plan as well as the already mentioned major developments in the procurement sector. The White Paper introduces a six-year law (the same duration as the national budget laws), which needs to be updated every three years. Thereby, to provide budget resource allocation stability, the latter also allows "the necessary Government and Parliament supervision on main acquisitions". Concerns about the future of the Italian Armed Forces, however, arose, analysing the three-year period (2016-2018) budget-planning document named "Documento Programmatico Pluriennale per la Difesa per il triennio 2016-2018". The latter demonstrates a restrained interpretation of the "Defence Function" – excluding the "territorial security function" assigned to the Carabinieri armed force – and by consequence of the operations and maintenance figures only mitigated by the extra funding for abroad operations. The procurement figure, devoted to the qualitative and technological modernisation of the military instrument, including acquisitions and research, is also affected and only partially mitigated by the funding coming from the Minister of Economical Development, which contributes consistently to this figure due to the contraction of the procurement funding included in the Ministry of Defence budget. ■





**Announcement and Call for Papers**  
**Brussels, 23/24 January 2018**  
**14<sup>th</sup> NATO Life Cycle Management Conference**

**MITTLER**  
**REPORT**

**LCM as a Joint Effort -  
Perspectives and Objectives for NATO, Major Industries and SMEs**

Chaired by: Thomas E. Pedersen and J. Bo Leimand (ret), Danish Defence Acquisition and Logistics Organisation (DALO)

The annual NATO LCM Conference will continue to consider the lessons learned and achievements made in areas such as Quality Assurance, Life Cycle Costing, Configuration Management, Acquisition Practices, Material Maintainability et al. as a basis for new and innovative, even disruptive approaches and perspectives which will be introduced in respective presentations. The event will again be organised in cooperation with the NATO Life Cycle Management Group (AC/327) and with the support of the NATO Industrial Advisory Group (NIAG) and the German CALS Forum. The conference will be combined with a small exhibition, where interested parties are invited to showcase respective capabilities and will take place at the Parker Hotel Brussels Airport (formerly: Golden Tulip) on **23/24 January 2018**.

**Scope of the Conference**

According to NATO's Systems Life Cycle Management (SLCM) policy the main goal of systems life cycle management is to efficiently and effectively deliver, use and maintain NATO capabilities. The primary objectives include:

- To have a common understanding of all aspects of SLCM, including operational and logistic requirements, affordability, time schedule, quality and risk;
- To create integrated and seamless business management practices that extend from initial concept through to retirement;
- To establish effective collaboration between all stakeholders, with clearly defined responsibilities;
- To facilitate technology insertion, mid-life updates and address obsolescence based on life cycle considerations;
- To define and apply an integrated systems approach to the development, use and support of systems, that meets specific requirements to minimise acquisition time, maximise effectiveness and minimise life cycle costs;
- To acquire systems that fulfil operational and logistic requirements, optimise internal and external interfaces, address integrated logistics and in-service support, and minimise production, in-service and disposal impacts on the environment.

Against this background, the 14<sup>th</sup> NATO LCM Conference will provide a platform for the presentation of innovative approaches and concepts in support of effective materiel management. In addition to specialist presentations and papers the conference will provide ample opportunity for the exchange of information between and among experts, programme managers and decision makers from the nations' armed forces, defence administration and industry.



**Briefing Abstracts**

The papers/briefings are to present status reports and results as well as expert analyses of current and future LCM, LCC and ILS implementation projects.

- Those interested in giving one or more presentation(s) in accordance with the theme of the conference are requested to submit their abstract(s) preferably in an electronic format (email);
- The time slots for the presentations are limited to 20 - 30 min. incl. 5-10 min. discussion time;
- Abstracts should not exceed 10 - 15 lines and should briefly address the subject and objective of the presentation;
- Your abstract submission should include the title(s) of the presentation(s), name and position of the speaker, organisation and full address with phone and fax numbers and email address.
- Deadline for the submission of abstracts: **29 September 2017**,

following which information on the selected papers and further information will be circulated.

**Points of Contact**

Please send abstracts to the PoCs below. AC/327 will be pleased to advise you on the content of your paper, whereas Mittler Report Publishing is in charge of all organisational aspects.

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# Viewpoint from London



## Learning from Remembering

**Tim Mahon**

Ten years ago last month, the Ministry of Defence in London published "Operation Banner: An Analysis of Military Operations in Northern Ireland". In the foreword, the then Chief of the General Staff, General Sir Mike Jackson, clearly stated his conviction that Banner was "one of the most important campaigns ever fought by the British Army and its fellow Services; [...] one of the very few waged on British soil; and one of the very few ever brought to a successful conclusion by the armed forces of a developed nation against an irregular force."

Ten years on – and approaching half a century on from the inception of the campaign in 1969, not far removed in time from the counterinsurgency campaign in Malaya – the impact of Operation Banner continues to be felt, although the anniversary was largely, regrettably, unacknowledged. Some lessons were learned and changed behaviour, doctrine and attitudes, while others were observed more in omission than in implementation – with tragic consequences in Iraq and elsewhere. The MoD report identified both positive and negative aspects of the campaign and its aftermath: it need not be reviewed again here. What is perhaps instructive, however, is to consider some of the changes that those who served in Operation Banner believe have been underestimated – or in some cases ignored. First and foremost – and something that has had a dramatic effect on command structures and tactical doctrine in the past two decades – is the issue of Command. Prior to Operation Banner – and in its early years – tactical command had been exercised primarily at the platoon level, with the Platoon Commander being the sole leader in the field. Section Commanders had limited autonomy and enjoyed virtually no decision-making flexibility. The Army had taken the existing tactical command structure from the British Army of the Rhine and deployed it, unchanged, to Northern Ireland. Where it failed.

Perhaps that is too blunt, since it did not fail, exactly. But it did not provide an adequately robust foundation on which tactical counterinsurgency operations could be built. Very quickly – certainly by the period immediately after Operation Motorman in 1972 – the junior NCO became a far more important cog in the command machine. Autonomous decision-making – and to a degree a recognition of the consequences of that process – became the order of the day. Britain

had the 'strategic corporal' – fully 25 years before USMC General Charles Krulak coined the phrase in the late 1990s.

At the same time – and for broadly the same reasons – the UK re-developed extremely good counterinsurgency skills at the section and platoon level. These manifest themselves in expertise in such disciplines as vehicle check points and search missions, for both of which British troops have won plaudits from their allies and coalition partners in later engagements in both Iraq and Afghanistan. Developing skills on the fly as a result of mainly being prepared to fight an entirely different type of warfare in Germany was a challenge – and one to which British troops and their commanders rose.

That inventiveness sometimes required improvisation. When snipers became a significant problem for street patrols in Belfast and Londonderry, scientists on the mainland sought a method of confronting them in more or less real time. Racal adapted a small radar set to a harness-based system that could be carried by a single soldier. The system – Claribel – was fielded within six months of the requirement being defined and was immensely successful – not in enabling patrols to counter snipers physically, but in achieving the aim of neutralising them: acknowledging a viable detection system, they melted into the background. (Not, however, before a young infantry officer, then at RMCS Shrivenham, now a respected defence analyst and commentator, was seen wandering the streets of Ulster wearing a strange harness, looking for all the world as if he was waiting for someone to take a shot. Which he was: this was the most effective test methodology he could come up with consistent with the need for rapid testing!)

Attitude is another area in which experience from Operation Banner has been leveraged, almost absorbed, unobtrusively, into doctrine. To begin with, the differences between the conventional warfare they had trained for and the irregular operations they were now to conduct – often without the right equipment and frequently without adequate preparation or training – were not as apparent as they might have been, except to a few relatively junior officers, some more senior ones and a good number of junior NCOs waiting in the wings for their day in the sun. The consequence was relatively inefficient management of the military-civil interface: it took consider-



able time for active engagement with the population to become the norm rather than a perceived high-risk undertaking. There continued to be risks: the casualty figures speak for themselves. But the fact that civilian casualties ran at about one quarter of those suffered by the military is testament, in part, to an enlightened attitude becoming effective at the operational level: it became obvious that 'Hearts and Minds' was a face-to-face undertaking – not one achieved sitting in splendid isolation in an armoured vehicle. The operation had a tremendous impact on public perception of the Army, both in Ulster and on the mainland. Curiously, there were significant differences between the two. The creation of 'no go zones' in the Province, in recognition of and an attempt to defuse some of the sectarian tensions, was on the whole successful, largely because it was rigidly applied to British troops, even when off duty and out of uniform. Whilst it would be disingenuous to assert this turned attitudes to the British troops completely around, it did contribute to a measure of grudging respect for their keeping their word.

The change of attitude on the mainland was subtler and less beneficial. As the campaign spilled over onto mainland soil and threats to troops on their home ground became more pronounced, they began to spend less time in uniform and more in civilian garb. The

time was that on a Friday afternoon soldiers in uniform could be fairly certain of being given a lift home for the weekend soon after beginning to hitch a ride. By the time the campaign began to have an effect in Catterick and Aldershot, for example, the number of soldiers visible in uniform dropped significantly as personal safety, security and vigilance became far more important. A consequence was that the Army's visibility to the general public nosedived – just at the point when legitimate questions were being asked about how to counter the terrorist campaign.

The MoD's 2007 report was and remains a good initiative and official views of lessons learned and required changes in behaviour and doctrine are important. Equally important is recognising the fundamental changes in thinking, required at individual, unit and command levels as well as doctrinal evolution.

In case the reader thinks such reflections trivial, consider that, officially, 1,411 British military personnel died during Operation Banner. By comparison, fatal casualties suffered in Iraq totalled 179. In Afghanistan the toll stood at 456. The importance of the Op Banner anniversary lies in its historical relevance, for as such events are forgotten or ignored, so too are the lessons they imparted. Mike Jackson claimed success, but perhaps the lessons learned in Malaya ought to have been recalled as a better starting point.

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# Moldova's Difficult Course Forward

## What Does Moldova Offer Europe?

**Nina Lutterjohann**

**As EU enlargement expanded from Central Europe and the Baltic in 2004 to the Black Sea Coast in 2007, Moldovan politicians were encouraged to bring their country closer to the EU. Things have changed since and Moldova's path towards the EU remains as difficult and troublesome as before.**

**T**his article considers how the Moldovan government has performed over the past years, how the EU has responded and how Moldovan politicians have dealt with the Transnistrian conflict and Russia's influence in the wider sense. The article then assesses the prospects of EU or Eurasian Economic Union (EAEU) integration, also with respect to the impact of remittances onto Moldovan societal structures.

The German government sought to help the impoverished post-Soviet country to modernise and settle the Transnistrian conflict. Then-Minister for European Integration, Iurie Leanca, impressed the German Christoph Heusgen, Merkel's national security advisor, who was eager to bring Moldova into Javier Solana's celebrated "ring of friends" in Brussels. In 2015, Leanca, before the end of his tenure, unexpectedly resigned due to lack of commitment from the pro-European coalition to implement the necessary reforms. With the notorious US\$1Bn fraud from three national banks on 28 November 2014, Moldova became a media darling but was removed from the list of exemplary countries. The amount is an equivalent of one eighth of Moldova's funds spent between 2012 and 2014 and also symbolised a political show trial for former Prime Minister Vlad Filat (2009-2013), sentenced to nine years of prison last June.

In 2017, following the Association Agreement (AA) negotiations, Johannes Hahn, Commissioner for European Neighbourhood Policy and Neighbourhood Negotia-

Photo: Moldova.gov



***The Moldovan authorities have expressed their concern regarding military exercises held jointly by Russian and Transnistrian troops.***

tions, pointed out: "We remain committed to support[ing] the Republic of Moldova on its way towards political stability, democratic reforms and economic development, for the sake of its citizens." EU trust has decreased, however, especially with the frequent news reports on political corruption within the government coalition. Politicians in Moldova have followed a typical trend of European integration and have been as recalcitrant as some EU member states. For instance, Poland did not perform as expected when the right-wing government passed a new law effectively limiting judicial independence. Hungary, under Victor Orbán, acted similarly, and the government controlled media law has been criticised for violating European values and provoked EU sanctions. In case of Moldova, further prob-

lems occurred straining the already difficult relations with the EU. The "Miami Herald" described the money laundering in Moldova as endemic given the very noticeable divide between poor and rich. This includes citizenship sell-outs. Investors in the state are offered citizenship, which could give Russians, people from other CIS countries and Iranians an entry ticket to the EU, even at the peak of the ongoing migrant crisis.

### **"Endemic" Corruption**

This problem limits Moldova's objective of EU integration through economic reforms, which can facilitate the transition to a market economy, creating conditions for an independent judicial system and curbing political corruption. The answer to

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**70% of Moldova's electricity is generated at Transnistria's Kuchurgan power station.**

this “endemic” corruption can be found in the Soviet legacy and Moldova's energy dependency on Russia vis-à-vis Transnistria. A major problem is the gas debt and the fact that 70% of Moldova's electricity is generated at Transnistria's Kuchurgan power station. The promising energy deals concluded with the Ukrainian company DTEK and Moldovan state-owned intermediary Energocom seem unreliable. RFE/RL published recently that Lyndon Allin, an associate at Baker McKenzie and former OSCE official, stated at a conference on 13 July that of the total energy consumption in the former Soviet republic, 98% is imported, most of it from Russia and the imports are transported through Transnistria.

The Polish think tank PISM emphasised that the Council of Europe's Venice Commission and OSCE's Office of Democratic Institutions and Human Rights (ODHIR) issued a negative review of a draft electoral law that would make the parliament undemocratically powerful. Despite unpopularity at home the official media oligarch Vlad Plahotniuc upholds a pro-Western course to receive EU and US approval to qualify for funds. If this is intended to save Moldova's face or fate, exploiting the last traces of values and the goodwill of genuinely interested partners to accelerate development, results remain to be seen.

Still unknown is whether Moldova can maintain medium-term credibility to continue its path of European integration. Plahotniuc, the puppet behind Prime Minister Pavel Filip's Democratic Party (PDM) follows a pro-Western course that stands in sharp contrast to President Igor Dodon's Party of the Communists of the Republic of Moldova (PCRM). Plahotniuc shares similarities with Georgia's businessman Bidzina Ivanishvili and Dodon appears similar to former Ukraine President Viktor Yanukovich, in

terms of relations with Moscow. It is therefore ironic that Dodon and Plahotniuc's aims are not as different as proclaimed. Curbing reforms to maintain control over political and business interests serves an immediate purpose but neglects the long-term objective. Moscow continues its power politics by using the Transnistrian conflict to control Moldova's foreign policy in the form of sanctions on agricultural products and wine as well as threats to expel Moldovans guest workers from Russia to prevent Moldova's closer EU relations.

### Eurasian Economic Union (EAEU)

The most recent tool offered implicitly by Moscow to Chisinau has been the Eurasian Economic Union (EAEU), which high-

lighted beneficial trade with Moscow. In that sense, Transnistria's economic interests have remained ambiguous as the illicit border trade remains lucrative. According to the European Commission's DG Trade in 2015, the business community on both riverbanks exported 60% of its products towards the EU (predominantly Romania) and 40% towards Russia, which showed that Moscow has control. In an independent journal, Anatoly Dirun, Scientific Leader of the Tiraspol School of Political Studies, identified major priority areas for the new President of Transnistria and addressed the mutual exclusive options that the EU and EAEU offer. According to him, due to an interview by the author of this article in October 2016, the EU remains important to Transnistria economically and relations are governed by a special agreement. Based on Russian utterance otherwise, an academic scholar on the region forecasted that the Deep and Comprehensive Free Trade Area (DCFTA) does not preclude maintaining bilateral trade relations with other post-Soviet countries and the EU member states. Even this opportunity has been clouded, as Moldovan political elites have repeatedly shown “political expediency” through EU (and other international) funding regarding confidence-building measures and modernisation of the healthcare system and infrastructure. In early April this year, the German newspaper “Die Welt”, based on an interview with Igor Dodon, wrote that more than half of the €782M provided to Moldova between 2007 and 2015 “disappeared through murky channels (...) stolen by



**The most recent meeting of the Supreme Eurasian Economic Council was held in Bishkek, Kyrgyzstan, in April 2017. To date the Eurasian Economic Union (EAEU) has not met Russian expectations of developing a viable alternative to the European Union.**

corrupt members of the so-called pro-European governments.” Numbers and figures about the embezzled aid money lead to the assumption that the governmental divide happens at the expense of the population that remains impoverished and rely heavily on remittances coming from various countries.

### The Impact of Remittances

Many highly skilled workers, Moldovan youth and seasonal workers have left the country. At the same time, the remittances mean that the country cannot survive by itself. The 2013 “Survey of Households: Country’s Migration Profile” indicated that 411,566 persons were abroad, of which 30% were urban and 70% were from rural areas. Moldova is dependent on their émigrés’ remittances and continues to send migrants towards the EU, particularly Italy, Romania, the US and Russia (depending on linguistic preferences). For the country, this has drastically prevented improvements in institutional capacities, the rule of law and the implementation of economic incentives.

In 2014, based on the National Bureau for Statistics, Moldova received over US\$18M in remittances and counted 146,654 persons abroad (of which 60% were female), with 15% in Western Europe, primarily Italy and 55% in the CIS, predominantly Russia and only around 40,000 in the US. The issues of concern are all interconnected. The brain drain due to emigration

reflects the poor economic conditions and the political divide between President and Parliament indicates the societal urban-rural and cultural-linguistic divide between Slavophone and Romanophone Moldovans (regarding employment and demographic development), which have profoundly impacted the economic landscape. Questions remain over traditional values, including the significance of the Church. The popular Metropolis of Chişinău and All Moldova is subordinated to the Russian Orthodox Church and the former Metropolis of Bessarabia, banned during the Soviet era, resides under the Romanian Orthodox Church. The Church is important as its traditional values, politicised thereafter, clash with secular and modern values, being associated with the EU integration. Despite aforementioned challenges Moldova’s quest for EU integration has not diminished. However, Moldova’s priorities need to be redefined.

### What Does EU Integration Mean?

Profound misunderstandings over what the integration process means, other than visa-liberalisation, remain among the Moldovan public. Therefore, expectations by the EU should be moderate given Moldova’s extremely volatile domestic political situation, characterised by entrenched oligarchic interests. The recent attempt to change the electoral law confirmed existing suspicions that the EU should be more careful in providing funds.

Former ambassador of the EU to Russia, Michael Emerson, told Eurasia Review: “Today Moldova is hugely more dependent on trade with the EU than Russia. To join the Eurasian Economic Union (EAEU) would be economic suicide for Moldova, as well as deepening the European-Russian divide in society. Economic prospects could improve a lot if Moldova seriously implements its Association Agreement, but this includes cutting corruption.”

The messages are not always clear. Sometimes, Moldova seems dependent on breakaway Transnistria because the de facto state has exported to the EU within the scope of an AFT between the EU and Moldova. Equally, industry facilities are occasionally in disrepair and cause people to desert (which also happens in Moldova itself).

Former de facto president Yevgeny Shevchuk and his family fled Transnistria and now reside in Moldova. A Russian newspaper used this information to suggest that the Moldovan authorities can now use Shevchuk against Tiraspol and Moscow in the context of the forthcoming blockade of Transnistria and the possible withdrawal of Russian peacekeepers from the banks of the Dniester. In the current conflict solution efforts Tiraspol feels excluded. At the same time, Moldova’s energy debt and the provision of funds to Transnistria permit Russia to control the unrecognised territory. The current de facto president of the unrecognised republic, Vadim Krasnoselsky, told a Russian newspaper (gazeta.ru), the representatives of the Russian government would complete the audit of the budget and economy of Transnistria. It would then be clear how much Transnistria is owed to whom. Krasnoselsky advised Dodon not to interfere in Tiraspol’s relations with Moscow but mind his own business.

The aforementioned presentation raise a question regarding what is the effect of the divided society on the country’s national security?

### The Effect of the Divided Society on the National Security Strategy

The growing disagreement between Moldova’s president and parliament exemplifies how deeply divided the country is at the social level. In 2014, polling numbers concerning the European integration were divided 50:50, excluding the Russian-speaking minority. In regard to the national security strategy, it seems that economy and ge-



Photo: Wikimedia Commons

**Orthodox church in Chişinău: The perception that traditional and particularly religious values clash with secular and modern values, associated with EU integration, is popular in Moldova.**



opolitics must be considered separately. Further misunderstandings about the purpose of the NATO liaison office were intentionally caused, although it rather stands for modernisation. The geopolitical tug-of-war has remained the central focus and benefits the local elites by distracting the public from domestic chaos.

In the shadow of Ukraine and Romania, the elite has pursued a policy of neutrality towards NATO and a strategy of bandwagoning in the field of foreign affairs as a whole. NATO's open door policy has now led to serious talks about the alleged establishment of a liaison office in Chisinau and reignited the existing sparks between parliament and president. As a side effect, it widened the geopolitical chasm. Considering the consequences for Ukraine after the AA, Moldova has been wary of inviting Western partners into the country. To conclude, societal polarisation, lack of will to pursue the fight against corruption and uncertainty over how much Moldova will align with the EU or Russia continue to dominate the discourse. Moldova's current political establishment wishes to receive further funds from the EU but rejects accountability. Finally, a clash of interests exists between Presi-

Photo: Kremlin



**Moldovan President Igor Dodon and Russian President Vladimir Putin: While Dodon prefers strict neutrality between Russian and the West the Moldovan parliament is inclined to pursue Euro-Atlantic integration**

dent Dodon's vision of a strictly neutral Moldova and the parliament, which is inclined to pursue Euro-Atlantic integration. Also, the quarrel of interests within the political pro-European coalition is sad and increasingly worrisome and makes a future association with the EU an unlikely

undertaking in the medium- and long-term. As long as interests do not reverse from corruption towards stabilising the economy and the rule of law it cannot halt cumulative emigration and improve prospects for a better future, which currently looks rather dim. ■

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# Armenia and the South Caucasus Security System

**Gayane Novikova**

The South Caucasus region is among the most vulnerable parts of Eurasia. Several external and internal factors greatly contribute to its instability. None can be analysed separately owing to their interconnection, interaction, and mutual influence.



Photo: Armenia Tourism

*Just as its Tatev monastery lies at the threshold of the mountains, Armenia marks the junction of Europe, Asia and the Middle East.*

The most important factors have been defined by unresolved conflicts and the existence of three types of statehood in the region: Armenia, Azerbaijan, and Georgia are internationally recognised states; Abkhazia and South Ossetia are semi-recognised state entities; and the Republic of Artsakh (until February 2017: Nagorno Karabakh Republic) is still not recognised by any state. The vulnerability

of the South Caucasus is rooted also in the lack of even the notion of a regional security system: three main stakeholders of this area – Armenia, Azerbaijan, and Georgia – bind their own security mainly to the different external powers. Moreover, unlike Georgia and Armenia, Azerbaijan builds and maintains its security without actively cooperating with or being engaged in any political-military bloc. To different degrees, each of these states has been excluding its immediate neighbour(s) from its security orbit.

Furthermore, the South Caucasus, being in close proximity to the Middle East, faces the risk of becoming a target of the different Islamist terrorist organisations that penetrate this region mainly from Syria,

Turkey, and Afghanistan, as well as from the North Caucasus. Armenia's security is quite sensitive to developments in the Middle East, especially in regard to a) the situation in Syria and the flow of Syrian refugees mainly of Armenian descent into Armenia, b) the Turkish-Iranian relations, and c) the regional implications of the Kurdish referendum on independence from Iraq.

And, finally, the degree of instability in the South Caucasus has been defined also by the increasing or decreasing involvement in the regional processes of external powers, such as Russia, Turkey, Iran, the EU, and the US, and their interaction with each other. Any complications between the main external – to the South Cauca-

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Photo: Achemish

### Current military situation in Nagorno-Karabakh

sus – powers can lead to drastic changes in the security situation in this area. Although the internal instability in all state entities of the South Caucasus has different roots, the external factors influence the internal developments of these states significantly. In particular, a lack of strategic vision by Armenia's political elites, combined with internal political, economic, and social problems, increases the vulnerability of Armenia to external threats.

From the security viewpoint the case of Armenia is the most complicated. In many ways, it has been characterised by its direct involvement in the Nagorniy Karabakh (NK) conflict and full-scale political, economic, diplomatic, and military support to the unrecognised Republic of Artsakh. This factor lies at the foundation of Armenia's relationships with all its neighbours and limits its manoeuvrability. It does not have diplomatic relations with Turkey and Azerbaijan – two of its immediate neighbours. Instead, it tries to achieve the highest possible level of partnership with Georgia and seeks to preserve balanced relations with Iran. In the meantime, the Armenian-Russian relationship influences Armenia's relationships with its immediate neighbours in many ways.

### Armenia – Azerbaijan – Turkey: Quo Vadis?

Three main issues – speaking of the absence of diplomatic relations between Armenia and Azerbaijan as well as Armenia and Turkey, the unresolved NK conflict in which Armenia and Azerbaijan (and the unrecognised Republic of Artsakh) are parties, and the strong psychological mutual dependence between Turkey and Azerbaijan – have complicated Armenia's relations with Turkey and Azerbaijan. They crucially narrow the manoeuvring space for each side of this triangle while simultaneously intensifying it to a peak their interconnectedness.

From the regional security perspective – and Armenia's security in particular – the Armenian-Azerbaijani relations define the status quo in the South Caucasus. As parties of the NK conflict, these two

- A significant increase in Azerbaijani military attacks not only along the Line of Contact between Azerbaijan and Nagorniy Karabakh but also in Armenia proper, followed by a growing number of casualties.
- The noteworthy military spending of the parties to the conflict (according to SIPRI, in 2016, Armenia and Azerbaijan spent 4% of respectively \$26.3 and \$165Bn GDP).
- The lack of contacts between the civil societies, and direct dependence of internal processes upon the situation in the area of the NK conflict.

However, a full-scale war will become unavoidable only if a sharp shift and change in the balance of powers between the parties to the conflict occurs and if main external actors will saliently "agree" to allow a transformation of the NK conflict into the overt war.



Photo: US DoD

### Georgian troops during the Georgian-Ossetian conflict

states have mutually exclusive approaches to its resolution. The four-day war in April 2016 clearly indicated a dangerous aggravation of tension. Furthermore, several secondary factors portend a further growth of tension that can contribute at any moment to a resumption of a small-scale war.

Secondary Factors are:

- A stagnation of the negotiation process within the framework of the OSCE Minsk Group.
- Belligerent statements by the Azerbaijani side and its rejection of an increase in the number of members of the OSCE monitoring group and their location in the area of the conflict.
- Azerbaijan's refusal to withdraw snipers along the Line of Contact with Nagorniy Karabakh.

Turkey, whose relations with Armenia determine in many ways by the Armenian Genocide during the Ottoman Empire, has been contributing to the Armenian-Azerbaijani confrontation by its full-fledged support of Azerbaijan. This resulted first and foremost in a closure in 1993 of its border with Armenia, and in its unwillingness to establish diplomatic relations with its neighbour.

It is not by chance that Turkey and Azerbaijan, who share strategic interests in the South Caucasus, are excluding Armenia from regional economic cooperation projects. However, a significant difference in their approaches toward Armenia exists. For Azerbaijan, the resolution of the NK conflict and the return of Nagorniy Karabakh and areas, which have been under Armenian control since 1994, is an absolute priority. As for Turkey, owing to its cur-

rent domestic and international developments, Armenian affairs have become of secondary importance in its foreign policy. Any probability of Turkey's direct participation in an Azerbaijani military operation against Nagorniy Karabakh and Armenia is excluded.

## Azerbaijan – Georgia – Turkey: A Pragmatic Partnership?

In parallel with the complicated Armenian-Turkish relations and the deficiency of Armenian-Azerbaijani relations, a trilateral partnership is emerging in the South Caucasus: Turkey, Azerbaijan, and Georgia are moving to a closer and broader economic and political-military cooperation, in spite of existing problems in their bilateral relations. Broad security issues are of mutual concern to these three states.



Photo: Digdori

**DIDGORI 2 Georgian-made armoured personnel carrier**

because of its role in the NK conflict negotiations on one hand and on the other hand because they provided military support to Armenia. According to the APA: "Noting the negative impact of international terrorism and aggressive separatism on peace,

security guarantor and a main supplier of weapons. Moreover, Armenia hosts a Russian military base that, in Georgia's view, can be used against it.

**b)** Whereas Georgia sees NATO as the only guarantor of its security, Armenia is a member of the Russia-led CSTO (Common Security Treaty Organization), and an active participant in several NATO programmes.

**c)** Russia in many ways orchestrated the "Georgian conflicts." It later recognised the independence of Abkhazia and South Ossetia and significantly increased its military presence in these territories. Conversely, Armenia appreciates Russia's role as a mediator in and out of the OSCE Minsk Group. Furthermore, as a party to the Nagorniy Karabakh conflict, Armenia has been forced to support Russia's position regarding Abkhazia and South Ossetia.

As a consequence of all of these factors, these two states have become reluctant neighbours. Armenia a priori is a secondary actor for Georgia in spite of many factors that could greatly contribute to a mutually-beneficial cooperation. However, from Armenia's security perspective, and in the context of developments in the South Caucasus, the Georgian direction is of strategic importance. Hence, Armenia should secure a strong partnership with Georgia not only on the level of bilateral relations, but also through broader cooperation in different international organisations, such as NATO, Black Sea Economic Cooperation (BSEC), the European Union, and the Council of Europe. Besides, a stable Armenian-Iranian relationship can contribute to a reduction of Georgia's dependence on Azerbaijani oil and gas.

## Conclusion

The security deficit in the South Caucasus is growing, and each of the main internal and external actors of this area contributes to it. Armenia, owing to many factors, as partially analysed above, can maintain its security only through the design and implementa-

Photo: author



**Samvel Mkrtychyan, Armenia's ambassador to Lebanon, hands UN medals to Armenian peacekeepers concluding the fifth shift in UNIFIL in June 2017.**

The trilateral Turkey-Azerbaijan-Georgia format in defence and security areas has become quite productive over the last five years. The most recent meeting of three defence ministers took place on 23 May 2017 in Batumi, Georgia. Participants discussed the military and political situation in the region, prospects for a tripartite military cooperation, and regional security issues. They agreed to widen the joint military exercises and to create additional mechanisms for cooperation in the field of military education and military medicine.

All three states have complicated relations with Russia, including those related to the regional conflicts. For Turkey, Russia's role in the Syrian conflict is problematic; for Georgia, Russia is a direct participant in the Abkhazian and South Ossetian conflicts (both Abkhazia and South Ossetia have been recognised by Russia as independent states); and for Azerbaijan the confidence in Russia is low (despite the purchase of modern Russian weapons on a large scale),

stability and development in the region, the sides stressed the need for joint actions to confront threats directed against the security of states." Other viable platforms for a trilateral partnership are Azerbaijan's energy resources, and the EU hesitation to enlarge and deepen its cooperation with Turkey, Azerbaijan, and Georgia, although for different reasons.

## Armenian-Georgian Mutual Reluctance

The complexity of Armenia's relationships with Azerbaijan and Turkey on the one hand and the tense Georgian-Russian relationship on the other hand, complicate Armenian-Georgian relations, and significantly limit the spheres of their mutual interaction. The conflicting approaches in respect to security affairs are more sensitive and visible in the Armenia-Russia-Georgia triangle.

**a)** For Georgia, Russia is a main security threat; for Armenia, the latter is a main



tion of more flexible and balanced foreign as well as security policy. It is obvious that the resolution of the Nagorniy Karabakh conflict is of high priority for Armenia. The Armenian society at large understands quite well that the state's full-scale involvement in this conflict is an obstacle to its inclusion in several important regional projects. In the meantime, and despite the efforts and appeals of mediators, there is no sign of a peaceful resolution of the conflict. Furthermore, at present, Armenia is the only security guarantor for the Armenian population of the Republic of Artsakh. This factor cannot be ignored. Two other factors that strongly influence Armenia's political and economic (in)activity in the international arena are its membership in the Russia-led political-military (CSTO) and economic (Eurasian Union) organisations and Russia-EU disagreements.

Therefore, Armenia's gradual return to a more balanced foreign policy should be viewed as a necessary step in maintaining the security of this state in broader terms. In spite of its strategic partnership with Russia and a delegation to the latter of a significant share of its sovereignty, Armenia withstood Russian pressure and did not recognise the independence of Abkhazia and South Ossetia; it took a cautious position regarding Russia's annexation of Crimea and, last but not least, enlarged its participation in NATO-led peacekeeping operations.

Armenia should find a way to balance the multilevel Russian involvement in and influence upon Armenia's foreign and domestic issues with – under the given circumstances and in conditions of very tense Russia-West relations – cooperation as active as possible first of all with European and Euro-Atlantic structures on a wide spectrum of issues. Armenia, as it is now speculated, can become a bridge between the European Union and the Eurasian Union. However, this state must prove, in order to play this role, that it is capable of defending and preserving its

sovereignty within the framework of the Eurasian Union and of acting as the liable partner for the European Union. Armenia should find a modus operandi with the EU that will contribute to the modernisation of its social-economic spheres of life as well. There is hope that a new bilateral Armenia-EU Comprehensive and Enhanced Partnership Agreement, which was initiated on 21 March 2017, will be signed in the foreseeable future.

From a regional security perspective, Armenia can be viewed as a stabilising factor in the South Caucasus.

Armenia can also contribute significantly to preventing the penetration of Islamist terrorist groups and the return of ISIS fighters through the South Caucasus in Europe. In conclusion, it is possible to state that Armenia has obtained the potential to become a strong actor in the South Caucasus. However, vulnerabilities of this area per se, Armenia's involvement in the Nagorniy Karabakh conflict, and growing discord between Russia and the West in general, constitute factors that have been reducing, and will continue to reduce, its capacity in the foreseeable future. ■



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## **Beka Kiria**

Independent Political Analyst; former Defence and Security Policy-Maker at the Ministry of Defence of Georgia

# Georgia – A New Cornerstone in Transatlantic Relations

**T**he active transatlantic flirt between Europe and the USA was re-energised after World War II and lasted until the end of the Cold War and the collapse of the Soviet Union.

Tracing the story back, from a Georgian perspective transatlantic cooperation began with the establishment of the Western European Union (WEU), primarily against Germany. Subsequently, US foreign policy underwent several abrupt changes, ushered in by growing concern over the increasing power of the USSR as an actor that managed to succeed where Hitler's Germany had not. Consequently, the principle of mutual defence was agreed, leading to the establishment of NATO - and the gates to the era of the Cold War were opened wide.

After the USSR dissolved, former Soviet Republics embarked on their own independent nation-building processes, significantly impeded in separatist regions by civil and military conflicts orchestrated by the newly established Russian Federation, in order to keep particular strategic regions under its strategic control. Even today, 26 years since regaining their sovereignty, Ukraine, Georgia, Moldova, Armenia and Azerbaijan face and have faced multiple challenges engendered by the conflicts fostered and supported by the Russian Federation in order to keep NATO and the WEU away from Russia's claimed "sphere of influence".

The Russian invasions of Georgia and the Ukraine, in 2008 and 2014 respectively, helped NATO to reshape and re-define its role in the post-cold-war world, after a period of political recession as a military alliance. In the light of Russia's undermining of the principle of territorial integrity, upon which the European security architecture had rested for decades, NATO resurrected itself and started to consider ways to respond.

Notably, the NATO Warsaw Summit marked a major change in the Alliance's policy to strengthen the eastern flank. Earlier, at the NATO summit in Wales after the annexation of the Crimea, NATO promoted the idea of reforming already-existing forces – the NATO Response Force (NRF) and the Very High Readiness Joint Task Force (VJTF). Stationed in carefully considered locations, these forces are a rapid action tool to deter possible conflict with Russia.

On top of that, the Black Sea has become an active strategic spot encapsulated in NATO's security arrangements with Romania, Bul-

garia and Georgia. In the case of Turkey, its role in the regional security architecture is still uncertain despite Turkey's NATO membership. A state with aspirations of becoming a strong regional power, Turkey has wide-ranging partnership opportunities with Russia regarding the Black Sea and their shared anti-Western political inclinations.

Due to these political dynamics Georgia's strategic significance has greatly increased. First, its physical location between Turkey and Russia makes Georgia an important partner. Second, while aspiring to be a member of NATO, the country supports and contributes to NATO's security architecture within the Black Sea region. Third, as part of the NATO Response Force, Georgia hosts the multinational US Army Europe-led exercise, Noble Partner. Noble Partner exercises were established in 2015 in order to train service members from the Georgian Armed Forces and NATO member states for the NRF and to assist Georgian troops in improving their interoperability with NATO military units. In a nutshell, the exercise enables Georgia to comply with, interoperate with and contribute to the NRF.

In contrast to the above-mentioned political dynamics, the world operates on multiple levels. Aside from European security arrangements, the US is facing a strategic shift from Europe to Asia that creates a significant uncertainty about Russia, and so the idea of enhancing European military capacity is discussed at length within the EU.

But, before unleashing the EU's military potential, a well-remembered promise made at the NATO Bucharest Summit about the Ukraine and Georgia joining the membership of NATO (a process stalled by Russia's actions) should be revisited as a matter of trust. Furthermore, reversing any apparent loss of trust between Russia and NATO means recognizing Russia's "sphere of influence", which directly challenges Europe's own security arrangements and the logic of Western sanctions on Russia. For instance, President Obama's attempt to rebuild trust between the West and Russia resulted only in the latter's invasion of the Ukraine and subsequent involvement in Syria. Some may argue that multi-layered institutional arrangements should be employed in order to prevent Russia pressuring the rest of Europe, but we have to ask first if restoration of trust actually means fulfillment of Russia's "Soviet" ambitions?



# The Art of Bullying: Nuclear North Korea and its Place in East Asia

Jan Blinka

**Demanding North Korea give up its nuclear programme is like asking Russia to return the Crimea to the Ukraine. We do not expect any of these events to happen in the near future, that would mean, for both countries, a retreat from their strategic interests and long-term policies. In its search for nuclear power status, Pyongyang has been successfully deflecting continuous pressure from the international community while bullying all concerned to accept a new status quo in East Asia.**

North Korea's efforts to acquire nuclear weapons capacities are nothing new. They can be traced back to the 1950s, when cooperation between North Korean scientists and their colleagues from the Soviet Union began. Since then, despite the efforts of the international community, the North Koreans managed to master production of nuclear material, to perform five tests of nuclear devices, and to conduct a number of ballistic missile tests. Despite those successes, the North Koreans are still far from miniaturising nuclear devices transferrable into nuclear warheads, even though intercontinental ballistic missiles capable of hitting US mainland might soon be reality.

Although far from ready to be used operationally, nuclear weapons have long been the basis of foreign and domestic survival strategies of North Korean regime.

First, from a military point of view, they deter any potential attacker, who can ever think of removing Kim's regime by force. Kim Jong-il, father of the current leader, learned well from the fate of the Iraqi dictator Saddam Hussein and Libya's Muammar Gaddafi, who, according to Pyongyang's understanding, were deprived of their power because they did not possess a nuclear deterrent.

Second, the nuclear arsenal compensates for the disproportion in military spending. Although North Korea annually spends an average of US\$3.5Bn, which is approximately 23% of the country's GDP, it is much less than the military budget of South

Korea, which is about ten times bigger – in 2016, it reached US\$37.2Bn.

Moreover, obtaining nuclear military capability is also an important source of internal stability for the North Korean system. Nuclear status, which the regime has been publicly claiming since 2005, strengthens the legitimacy of the Kim dynasty in front of the population and confirms the important position of the army in the local power structure. In addition, thanks to atomic weapons, North Korea belongs to the "elite club" of a few nuclear powers of the world, which further increases the domestic reputation of the regime.

## My Rationality is Not Your Rationality

The mistake that some observers, journalists, and diplomats are making is that they apply their own rationality to assess North Korea's behaviour. What, however, is reasonable and understandable for one, may seem the opposite to another. Ground-breaking work, which rejects the application of a universal rationality to explain the behaviour of states, was the RAND Corporation report from 1977. In it, Jack L. Snyder explained the unique strategic culture of the Soviet Union, which – based on a unique combination of Soviet history, po-

litical institutions, and strategic situation – influenced Moscow's foreign policy during the Cold War. Similarly, we can proceed in the case of North Korea. Over the course of more than sixty years there has been a distinct understanding of North Korean rationality, whose roots can be found most importantly in the Japanese occupation, the experience of the

Korean War, South Korean military and economic superiority, the fear of a US preemptive strike, the loss of the Soviet and Chinese nuclear umbrellas, and in the importance of the Kim dynasty for the preservation of North Korea's sovereignty. By combining the aforementioned influences, the North Korean regime has come to the belief that nuclear weapon ownership is the only reliable way to ensure its survival. Pyongyang does not have the economic means to build a conventional army that would match the South Koreans or diplomatic means to negotiate alliances that would provide protection against attack by a stronger opponent. In this situation, development of the nuclear programme was the most rational and economical choice.

Certainly, development of nuclear weapons can be seen as an investment returned to the regime many times. Thanks to nuclear weapons, a smaller regional state with a



## Author

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decaying economy becomes a global actor who can play along such powers as the United States, Russia, and China.

## The Master of Bullying

However, neither of those countries is particularly content with North Korea's nuclear ambitions. Since Pyongyang's first test of nuclear devices in 2006, the members of the Security Council have shared the view that such actions are "detrimental to peace, stability and security," responding to them by series of international sanctions. Their aim is to pressure regime economically forcing it to abandon its goal of developing operational atomic weapons.

Although several rounds of sanctions have been adopted, they have not contributed to the desired outcome – and the same can be said about six-party talks or about any other international negotiation format. Moreover, different approaches and policies of US and South Korean presidents have failed to change Pyongyang's attitude as well. To stop the North Korean nuclear programme, neither Bill Clinton's cooperative stance, George Bush's hawkish attitude, nor even Barack Obama's strategic patience brought desired result.

No matter what the external attitude is, North Korea sticks to its main goal, bullying successfully all others to accept new

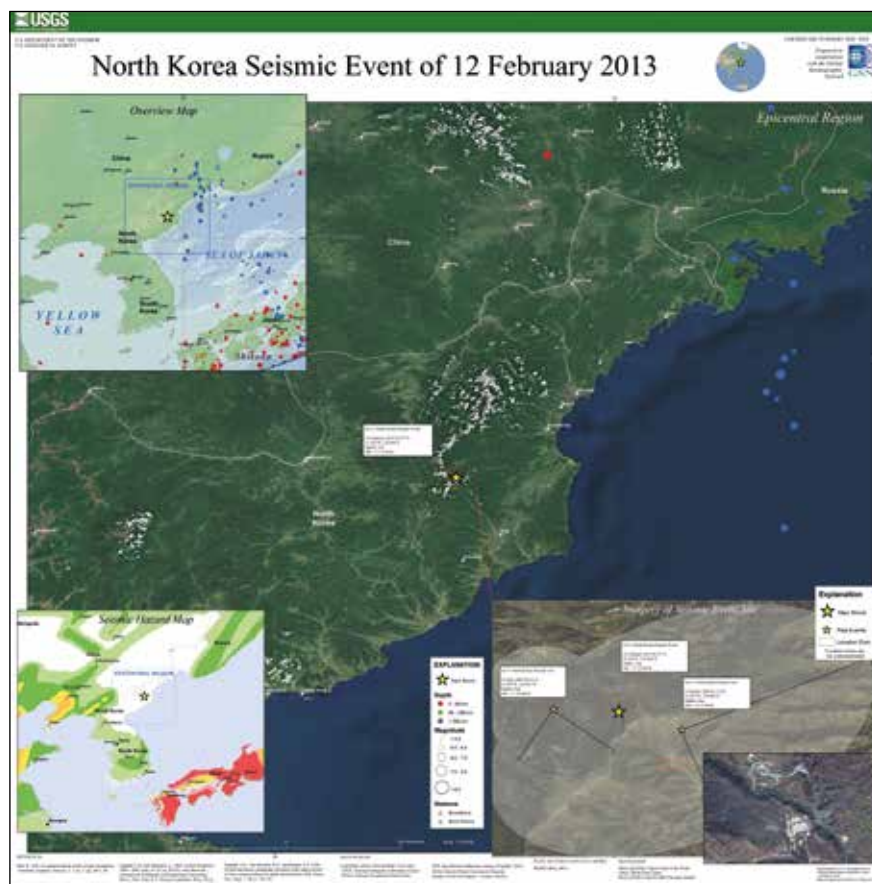
Photo: J.A. de Roo



**The Kim regime enjoys popular support - or subservience.**

status quo in East Asia – that the Kim dynasty rules a nuclear-power state. It is just surprising that North Korea, supposedly a crumbling country on the brink of

survival, is so skilled in exploiting positive incentives while pushing its own goals, no matter the pressure from the outside world.



## US Reaffirmed Its Commitments

However, discontent with recent acceleration of Pyongyang's nuclear and ballistic programmes has grown widely among the countries of the East Asian region, which – as well as applying collective and individual sanctions – have taken concrete steps to strengthen their security.

South Korea has already been increasing its military budget for several years, topping the sum of US\$37.2Bn in 2016. Japan's military expenditure increased in the same year as well, reaching US\$41.6Bn. One of the major strategic changes occurred in 2015, when Tokyo approved a reinterpretation of its constitutional Article 9. This shift allows the country to participate in collective self-defence – for example in dealing with the North Korean problem. Additionally, Seoul and Tokyo last year signed an agreement on intelligence sharing to deepen their military cooperation, which could be the basis for the United States-led alliance in East Asia.

Washington has re-affirmed repeatedly its commitments to East Asian partners and through the deployment of the THAAD



antiballistic system increased its presence in South Korea, where currently 28,500 American soldiers are deployed. China, however, sees these steps as part of the American containment strategy against Beijing and its superpower ambitions. For that reason, Kim Jong-un's nuclear ambitions are gradually posing a major problem for China, for a long time the only ally of North Korea, as they justify the growing involvement of the United States in the region.

## China Does Nothing with North Korea

The basis of the Chinese strategy towards the Korean Peninsula is to maintain an independent North Korean state as a buffer zone between the Chinese border and the American units in the southern part of the peninsula. Beijing therefore disagrees with any actions that might undermine the stability of the Kim regime and not even Washington's greater presence in East Asia can change such a stance.

Even though China publically pressured its neighbour by the termination of coal imports from North Korea for the rest of this year and warned Pyongyang that it will reduce its oil supplies if North Korea carries out a sixth nuclear test, overall trade between the two countries rose in the first half of 2017.

To convince China to put more pressure on Pyongyang is supposedly one of the key elements of President Trump's approach to North Korean nuclear problem. By doing that he wants to distinguish himself from the so-called strategic patience of his predecessor, Barack Obama. However, so far, President Trump has been unsuccessful in his efforts.

## Strategic Patience 2.0

Soon after his inauguration, President Trump stated that in dealing with Pyongyang "all the possibilities for solutions are on the table" – ranging from the discussion with Kim over a hamburger to a pre-emptive attack on North Korea's nuclear facilities.

Although President Trump recently reiterated that he would be willing to meet Kim Jong-un under "appropriate conditions," it does not seem that the offer of direct negotiations without preconditions is seriously considered in Washington. The commitment to military action is unlikely as well, not only because of the uncertain outcome of such operation, but also because of the possible escalation into open armed conflict.



Photo: taringa.net

**North Korean medical officers at a parade.**



Photo: Roman Harak

**Celebration of the close relationship between China and North Korea in Pyongyang.**

Consequently, the current US administration returned to the same components, which Obama's "strategic patience" had. One must point out that it was this policy, which gave North Korea time to develop its nuclear programme instead of ending it. President Trump added strong rhetoric and a more assertive attitude to already established mix of political tools. Under his leadership, the United States continues to pressure Pyongyang through uncompromising rhetoric, strengthening its military presence in the region, transferring part of the responsibility to China, increasing coordination with East Asian allies and calling for further UN sanctions.

## Does US Policy Work?

Assessing whether President Trump's policy towards North Korea is working is still rather premature. The sixth test of nuclear devices has not occurred, however, Pyongyang continues successfully with a series of

ballistic missile tests acquiring slowly the capacity to hit the US mainland. From that point of view, President Trump has not yet come up with right strategy to cope with Kim Jong-un.

The Kim regime would have to face a grave threat to its survival to consider seriously the abandonment of its nuclear ambitions. Indeed, North Korea did not do that even in the 1990s, when the country had to deal with the loss of its allies, the dysfunctional economy, the lack of fuel and foreign currency, and great famine.

Today, in contrast, the situation is quite different. Despite occasional reports, Kim Jong-un is still firmly in power, widespread starvation is long gone, and North Korea's economy is growing by 1-5% a year. The United States will have to augment its pressure on the regime exponentially or look for a completely different strategy to solve finally the North Korean nuclear issue. For that we will have to wait. ■

# The North Atlantic Treaty of 1949 and its Relevance in 2017

Eugene Kogan

It should be remembered and emphasised that NATO and its founding principles are not just Article 5. Moreover, it is not only the benchmark that two percent of the GDP should be allocated for the needs of the Alliance, as the US Presidents and Secretaries of Defense have consistently said to the rest of the NATO allies. On the contrary, Article 3 of the North Atlantic Treaty (also known as the Washington Treaty) clearly states that “the Parties, separately and jointly, by means of continuous and effective self-help and mutual aid, will maintain and develop their individual and collective capacity to resist armed attack.” The analysis below highlights the relevant articles and discusses their relevance in 2017.

Reading the 14 North Atlantic Treaty Articles makes it possible to detect the atmosphere of solidarity of the like-minded partners in 1949 with the emphasis on the issue of sharing values within the North Atlantic area. At that time, the founding fathers prepared another Treaty, which did not mention the points concerning the shared values, as it was difficult to foresee what may happen in the future. For instance, the Treaty did not cover the expulsion of a member state for the alliance, not any penalties for misbehaviour of which-ever member of the alliance regarding the principles of democracy, individual liberty and the rule of law. We need to remember that the founding principles were considered sacrosanct and the adversary, the Soviet Union, was clearly concretised.

The Treaty can only be terminated by the member state itself “after [it] has been in force for twenty years” (Article 13). However, the Treaty remains ambiguous as to if and when the Party to the Treaty decides to leave the military structure voluntarily while remaining a part of the political structure of NATO, for example, like France in 1966 and Greece in 1974. In other words, the Party to the Treaty has just partly terminated its membership and kept a right to rejoin the Alliance any time later on. And that is exactly what happened when Greece and later France rejoined the Alliance.

In addition to that, the Treaty omits information about a NATO country blocking the participation of the other members of the Alliance. This article was not envisaged at that time, since the main focus was on the cohesion and unity of the Alliance members. The recent case of Germany moving



Photo: NATO

**US President Harry S. Truman signed the North Atlantic Treaty in Washington DC on 4 April 1949.**

its military contingent out of Turkey – a member of the Alliance – to Jordan – a non-NATO member state – as a result of the Turkish government refusal to grant a right to the members of the German Parliamentary Defence Committee visiting the Incirlik Air Base, underlines the dilemma of the Alliance in the 21st century.

The non-Alliance members’ participation was not foreseen back in 1949. And the Partnership for Peace (PfP) programme was only established in 1994. Due to its conflict with first Israel and recently Austria, Turkey blocked the participation of both countries – as non-NATO states – in NATO activities. Speaking of Israel, Turkey lifted the blockade right after the relations between the two countries improved. However, concerning Austria, the NATO members, excluding Turkey, decided to maintain co-operating individually. Thus, the way out of this political impasse was found. As a result, Turkey

found itself isolated by the members of the alliance to its own detriment. Whether or not Turkey will block the participation of a non-NATO member state in the alliance activities again does remain to be seen.

## Cyber Attacks – Affecting Peace and Security in the 21st Century

The well-known Article 5 states: “The Parties agreed that an armed attack against one or more of them in Europe or North America shall be considered an attack against them all,” which is why it should also include the 21st century novelties such as cyber attacks that threaten both critical military and civilian infrastructure as well as the hybrid threats that incorporate a wide range of civilian tools. As a result, cyber attacks and hybrid threats should also be included in Article 6. In addition to that, Ar-



ticle 6 should at the same time exclude the following passage: “the Algerian Departments of France”, since Algeria has become an independent and sovereign state in the meantime.

On the other hand, the founding fathers foresaw some potentially unfolding realities back in 1949 and, as a result, inserted Article 10 into the Treaty: “The Parties may, by unanimous agreement, invite any other European State in a position to further the principles of this Treaty and to contribute to the security of the North Atlantic area to accede to this Treaty.” Thus, what did happen from 1999 onward, namely NATO’s eastward as well as southeast expansion, was laid down back in the Washington Treaty of 1949.

However, what is most surprising is why the NATO allies did not update the Treaty articles in 2007 during the first ever cyber attack on Estonia, a member of the alliance. Even though Article 12 says that “after the Treaty has been in force for ten years, or at any time thereafter, the Parties shall, if any of them so requests, consult together for the purpose of reviewing the Treaty, having regard for the factors then affecting peace and security in the North Atlantic area.” Articles 4 and 12 have a commonality, namely “consulting together” and “in the opinion of any of them, the territorial integrity, political independence and security of any of the Parties is threatened.” Peace and security in the North Atlantic area was affected because of the 21st century novelty: cyber attacks. For this reason both articles can be fully integrated by emphasising this hazard.

## NATO as a Consensus

Another important detail pointed out by Chris Donnelly is that NATO is a consensus rather than an organisation based on compromises. By evolving a system which limits the actions of the Alliance to only those issues on which consensus can be achieved, and aligning national interests in these areas, there is no essential loss of sovereignty and no threat to Allies’ national interests. But running a consensus process is difficult as well as laborious and consumes a lot of time, resources and political effort.

There is no doubt that a consensus-built structure has its strengths and weaknesses. On the one hand, on 31 May 2017 German newspaper Die Welt reported that several NATO countries led by Germany, France, The Netherlands and Denmark were not in favour of holding the NATO 2018 summit in Istanbul. In consequence, when NATO member states are united against their own member they are able to express their dissatisfaction and voluntarily ask that member to reconsider its decision. This was



Photo: NATO

**US President Donald Trump in conversation with NATO Secretary General Jens Stoltenberg: Since NATO was founded the United States has accepted a the lead role in the Alliance.**

the second time Turkey was embroiled in NATO’s internal dispute. Back in January 2013, Turkey launched the long-range air-defence programme known as T-LORA-

will not be integrated within the NATO air-defence system.

On the other hand, when NATO states lack consensus regarding a potential NATO candidate country such as Georgia, the unity and cohesion of the alliance comes under duress and highlights the weakness of the alliance. Thus, at this point NATO leaders need to think how to strengthen the consensus mechanism.

Besides, it is suggested that a new article on the right for expulsion as well as penalties for misbehaviour should be included. No member of the Alliance should block the proposed article, even though some members may consider such an article as infringing their rights.

An additional critical point was recently raised by Linas Linkevičius, Lithuania’s Minister of Foreign Affairs. He called for reform and a much faster decision-making process by NATO and its military command. Even though “a speeding-up of the decision-making process within NATO is a complicated matter, we have to do more, faster since crises do not wait. Political supervision is important but NATO’s military authorities should be given more authority, more power to take action.” The short notice should be clearly defined by the leaders of the Alliance. As a final point, the North Atlantic Treaty today is as relevant as it was in 1949. However, with the 70th anniversary of NATO rapidly



Photo: NATO

**Faced with a more demanding security environment, NATO has taken steps to strengthen the Alliance.**

MIDS. At that time, Turkey decided to look for solutions in China and Russia. Although Turkey selected China Precision Machinery Import-Export Corporation for the system in September 2013, it cancelled the deal in November 2015 as a result of disagreement with its NATO allies. Turkey’s allies made it clear that Turkey can purchase the system, but the system

approaching, the presented update of the Treaty is urgently required. There is no doubt that the founding fathers foresaw certain developments back in 1949, however, other changes that occurred since 2007 onward were difficult to anticipate. Even though the current Russia is no longer the former Soviet Union, Russia remains the adversary today as the Soviet Union was in 1949. ■

# Viewpoint from Madrid



Esteban Villarejo Ceballos

## Terror Attack in Spain

Jihadism hit Europe again. Spain suffered a double attack with a van in the Las Ramblas Boulevard of Barcelona and a car in the seaside town of Cambrils (Tarragona). At least sixteen people were killed. Even though the attacks were not planned, the terrorist cell was very well organised and recruited. They had even been working on a more destructive attack since February. It is the story of some shadows and a "miracle".

**SQUATTERS IN A HOUSE:** Spanish investigators consider that the jihadist cell might have prepared one or several attacks for at least six months. The "headquarters" of the cell was located at a house in Alcanar (Tarragona, Catalonia). First shadow: they were squatters in a house owned by a bank.

**"WELL INTEGRATED" YOUNG PEOPLE:** It is assumed that at least 10 jihadists took part in the attack. They all lived in the little town of Ripoll (Gerona, Catalonia region) where they were perceived as "well integrated" by their neighbours. Nine out of ten were between 17-27 years old. Nine out of ten were born in Morocco (one in Melilla, Spain). Second shadow: did their families not realise they were being radicalised by the local imam of the mosque of Ripoll?

**THE IMAM OF RIPOLL:** Abdelbaki Es Satty (born in Morocco, 45 years old) is believed to be the mastermind of the jihadist cell. The Spanish police knew him as a radicalised muslim and wiretapped his phone in 2005 due to possible connections with Al Qaeda. His name appeared in the context of other operations. He was in prison for four years due to a drug trafficking crime. Third shadow: Es Satty was not deported because of a judge who declared he was already rooted in Spain.

**THE EXPLOSION IN ALCANAR:** Why did the terrorist cell decide to attack? A huge explosion in the house of Alcanar on Wednesday night accelerated the attack with a "plan B": a rampage with vans and attacks with knives and an axe in the Las Ramblas boulevard (Barcelona) and Cambrils (Tarragona). Fourth shadow: The Catalan regional police found around 20 canisters of butane and propane gas and suggested those men were smuggling gas. Hours later, that explosion was connected to the Barcelona van attack. Should the Catalan regional police have informed the Spanish National Police about the explosion in Alcanar?

**THE MATERIALS OF THE "MOTHER OF SATAN" TATP:** Among other things, the Catalan regional police found at least 120 canisters of butane gas, 500 litres of acetone, hydrogen peroxide, bicarbonate, a large number of nails and buttons to activate the detonations. All these materials were intended to manufacture TATP (triacetone triperoxide), known among terrorists as the „Mother of Satan" explosive. In addition, the nails were to be used as shrapnel to cause as much damage as possible in the blast. Fifth shadow: how did they manage to buy such a quantity of acetone and bottles without spawning suspicion?

**INTERNATIONAL LINKS:** Another mystery to be solved is the international connections of the jihadist cell, mainly in Belgium, France, Switzerland and Morocco. The Police already knew that the mastermind of the attack tried to find a job in the Belgian town of Vilvoorde (near Brussels). He was asked about his criminal background and he disappeared. Belgian authorities advised the Catalan Police about his return to Barcelona in an "informal" conversation. This news was recognised by the Catalan police. Besides, four of the terrorists were in Paris days before the attacks, two of them in Zurich and many of them had travelled to Morocco this summer. Sixth shadow: is the international alert system effective?

**THE JIHADISTS:** Younes Abouyaaqoub, the terrorist driver of the van in Barcelona, was shot after a woman had recognised him; the five jihadists of the attacks in Cambrils were immediately shot by a heroic Mosso d'Esquadra agent, the regional Catalan police corp. Two other jihadists are now in prison. The leader of the cell and another terrorist were killed by the explosion in Alcanar.

**THE "MIRACLE":** The objective of the jihadist cell was a huge bombing attack against religious and touristic monuments. According to the Police the Sagrada Familia Church, landmark of Barcelona, was the main target of the terror attack. They had materials to manufacture 100-150 kg. of TATP for three van-bombs. They could not accomplish the mission because of the accidental explosion of the operational base in the house in Alcanar. Secondly, a second van broke down and they could not repeat the attack of Barcelona in Cambrils seven hours later.



# The Ukrainian Strategic Environment

David Saw

There are those moments in the history of a country when its people make brave choices, when there are no other options open to them and they decide to resist and rise up in protest against a kleptocracy that uses a veneer of democracy to legitimise its self-interested policies and its basic criminality. That was what happened in the Ukraine in November 2013 and continued until February 2014, when the protests became a revolution, leading to the collapse of the government and a movement to restore constitutionally guaranteed rights to the people.

What nobody could have foreseen was that these popular protests would lead to the annexation of Ukrainian national territory by a foreign power, or to be more precise the de facto annexation of the Crimea by Russia and its local surrogates in February/March 2014. At the same time secessionist movements grew in the Donbass in eastern Ukraine, in the Donetsk and Luhansk oblasts, later to declare themselves as the Donetsk and Luhansk People's Republics. From March 2014 these secessionist groups received military assistance from Russia in terms of both personnel and equipment. This set the scene for a Civil War that has continued, albeit at various levels of intensity, to the present day. Furthermore it is quite clear that the Russian government and its foreign intelligence service are not only actively directing the secessionist forces in the Donbass, but have been actively providing direct military assistance such as artillery and armoured support.

There is another side to this story though, where the causal factors are totally different. What started everything was not the anti-government protestors in the Ukraine, it was those who had directed, nourished and sustained these protestors. According to this narrative it was the European Union (EU), the US government and Non-Governmental Organisations (NGO) who were the forces behind the protestors and who directed an effort to bring down a legitimate government. The reason for all of this was to put a puppet anti-Russian regime into power in Kiev, as a part of a concerted strategy to put pressure on the Russian government.

This narrative has gained some rather diverse supporters internationally. In Europe, right-of-centre political groups have been sympathetic because the narrative reflects their views of the expansionist nature of the EU. On the political left they are sym-

pathetic to the narrative as it is portrayed as the result of an American plot. Others just see it as a conflict that could have been avoided and are quite happy to blame the EU, the US and any NGO that happened to be in the area.

This narrative was generated by Russia and has been artfully pushed in all sorts of different fora. What the narrative fails to answer is why would ordinary people flock to the Euromaidan protests in Maidan Nezalezhnosti, the central square in Kiev, when they knew that they would face extreme violence or even death at the hands of security forces loyal to the regime? You do not do that because you believe in EU expansion, or because you support US foreign policy aims or because some NGO has persuaded you. You do that because you sincerely believe that your country must change course and that a corrupt government must be held to account. The bravery and sacrifice of those who demonstrated at the Euromaidan cannot and should not be underestimated.

## Finding Ukraine

The objective of this article is to explore the Ukrainian strategic environment. A fundamental problem for the Ukraine has been the inability to build strong national political institutions and fairly enforce the rule of law, added to which significant structural economic problems have not been tackled in a satisfactory manner. These negatives are reflected in the fact that there have been two revolutions (2004 and 2014) since independence was officially achieved in August 1991, a sign of an immature and/or unworkable political/state structure.

To understand the Ukraine of today you have to look at its past and its long struggle for national independence. The importance of this struggle is reflected in the national anthem of the Ukraine which can be trans-

Photo: Ukraine Government



**Ukrainian President Petro Poroshenko meets with US Secretary of Defense Jim Mattis in Kiev in August 2017. Secretary Mattis stated: "Have no doubt...the United States stands with the Ukraine." The US might now supply defensive weapons to the Ukraine.**

lated into English as "The glory and the freedom of Ukraine has not yet perished," or alternatively as "Ukraine has not yet perished." The lyrics to the anthem were written by Pavlo Chubynsky in 1862 and the music was written by Mykhailo Verbytsky, the first public performance was as a choral work in the Ukraine Theatre in Lviv in 1864. The anthem was banned during the Soviet era.

After the First World War and the Russian Revolution, the Ukraine had endured some seven years of war and in the early 1920s there were already some signs of famine in certain areas. This ought to have been impossible, the Ukraine was one of the richest areas of agricultural land in Europe: by



Photo: Ukrainian Ministry of Defence

**The Ukrainian Army has returned the 152mm/54 calibre HYACINTH-B (GIANTSINT-B) field gun to service to provide an effective counter-battery capability. The gun has a range of 30 km and is shown here in a training shoot in June 2017.**

Photo: Ukroboronprom



**A Kharkiv Morozov Machine Building Design Bureau (KMDB) OPLLOT tank on display at a defence forum in the Ukraine in 2016. The Ukrainian Army is due to receive 10 new OPLLOT-M tanks in 2018. It is only now that the Ukrainian defence industry is receiving significant domestic orders.**

1910 the Russian Empire provided 36.4% of world wheat needs with the vast majority of this coming from the Ukraine. Bear in mind this was achieved with limited mechanisation, even by the standards of the time, and extremely inefficient land usage.

At the start of the Soviet era, Russian rule in the Ukraine was not totally repressive, indeed Ukrainian culture and language were encouraged. Things changed as Stalin became the leader of the Soviet Union - this was the time of the 'Five-Year Plan' - and by the end of the 1920s one of the objectives was to commence a policy of industrial development in the Ukraine. However, Stalin had other objectives as well, the first of these was to purge the Ukrainian intelligentsia, then collectivise Ukrainian agriculture and destroy the 'Kulaks' or rich peasants who would oppose collectivisation. The purges started in the late 1920s, then came collectivisation, action against the Kulaks and anybody else seen as an

opponent or potential opponent of Stalin. This was the start of the agony of the Ukraine that led to what is today called the 'Holodomor' or 'Great Famine.' Millions starved to death in a famine caused, not just by collectivisation, but by the deliberate actions of the Soviet government. Had they wished, they could have aided the Ukraine, instead while Ukrainians starved they exported food from the Ukraine to obtain foreign currency. In parallel with the Holodomor came the start of the Stalinist purges where millions were murdered, worked to death or sent to the Gulag. The terrifying toll of the Holodomor and the purges could not be discussed in the Ukraine until it finally achieved independence in 1991, it is estimated that the human cost of Soviet rule in the Ukraine in the 1920s and 1930s was some eight million dead.

Then in June 1941 came the Nazi invasion of the Soviet Union, Kiev, the capital of the Ukraine, was occupied from September

1941 until November 1943, The Ukraine itself was finally freed from occupation in October 1944. The cost of the war was enormous, up to eight million Ukrainian civilians died, as did 1.4 million ethnic Ukrainians fighting in the Soviet Army. It is estimated that only 20% of industrial capacity and 15% of agricultural equipment and machinery survived intact and there were more than 10 million homeless. Post-War border readjustments gained new territory for the Ukraine from Poland, Romania and Czechoslovakia. However, Stalin's suspicion of Soviet citizens who had been under foreign rule saw mass population transfers from the Ukraine and arrests of those whom the Soviets distrusted.

## Independence

From the Ukrainian perspective the abject failure of the Soviet system was made plain by the Chernobyl disaster of April 1986. It was not just the fact of the explosion at a nuclear power plant, it was also the badly handled rescue and recovery effort. This was at the start of the Gorbachev era, when Mikhail Gorbachev had become the General Secretary of the Communist Party of the Soviet Union (CPSU). Gorbachev instituted policies such as Glasnost and Perestroika in an effort to reform and reinvigorate the Soviet Union; these efforts failed and eventually this set the scene for the fall of the Soviet Union. This then created the basis for the Ukraine to follow its own path and on December 1, 1991, a referendum was held on the question of independence, turnout was 84% of eligible voters of whom 90% voted for Ukrainian independence.

On paper, with its industrial and agricultural capabilities the Ukraine should have had the tools to build a prosperous independent state, but it did not work like that. Building political and legal structures took time, the economy was in a dreadful state (inflation reached over 4,700% in 1993) and the country only managed to establish a currency (the hryvnya) in 1996. Then came the vast corruption created as the Ukraine saw the formation of its own oligarch class, with growth in both organised crime, including drug and human trafficking, and in street-level crime.

Establishing a nation state, the rule of law and civil society was one challenge. The other major challenge was dealing with Russia both as a domestic issue and as an issue of relations between States. There were certainly issues; inevitably, after independence the Ukraine wanted to prioritise the Ukrainian language over Russian, which led to discontent amongst Russian



speakers. That being said, as Ukrainians make up 77.8% of the population, it is understandable that they would want Ukrainian as a first language. The Russian community seemed to believe that Russian would be made a national language jointly with Ukrainian, although there was no compelling reason for the Ukrainian government to adopt this policy. However, the language issue remained problematic until a 2012 law giving 'regional languages' official status in the Ukraine.

Fundamentally the issue is very simple: Russia had and has major difficulties in seeing the Ukraine as an independent nation, with different cultural values and its own legitimate foreign policy requirements. The Russian belief is that in reality Russia and the Ukraine should be an indivisible whole. A Ukrainian foreign policy of closer ties towards Europe, or even worse the North Atlantic Treaty Organisation (NATO) is intolerable as far as Russia is concerned; far better that the Ukraine recognise that it needs to align itself with Russia or adopt a quasi-neutralist stance and accept being guided by Russia. Beyond that, Russia regards itself as the guardian of the rights of ethnic Russians, giving it the justification to intervene to protect ethnic Russian communities.

In 1954 the rule of the Crimea was transferred from Russia to the Ukrainian Soviet Socialist Republic. On Ukrainian independence the Crimea was the only part of the Ukraine with an ethnic Russian majority. Key factors in the context of the Crimea were the city of Sevastopol, the naval base and the Soviet Black Sea Fleet. The status of the Black Sea Fleet was resolved with the majority of the force being transferred to Russia. There was also an agreement on the naval base at Sevastopol, with a 20-year lease to Russia being agreed in 1997. Other issues were eventually resolved by the 1997 Treaty of Friendship, Cooperation, and Partnership signed between the Ukraine and Russia, which recognised the borders of the Ukraine and Ukrainian sovereignty within those borders. In April 2010 the Ukrainian government agreed to extend the Russian lease of the Sevastopol naval base out to 2042, in return they received concessionary prices on Russian natural gas.

There were other treaties between the Ukraine and Russia. On independence the Ukraine found itself with the third-largest stockpile of nuclear weapons in the world: some 50% of these weapons were shipped to Russia in 1992. The Ukraine wished to resolve the issue of the remaining ex-Soviet nuclear weapons and at the same time obtain security guarantees for its independence and territorial integrity. This saw the signature of the Budapest Memorandum

on Security Assurances on 5 December 1994, with the signatories being the Russian Federation, the US and the UK. China and France also separately signed documents providing security guarantees to the Ukraine.

Under the Memorandum the Ukraine would remove the remaining nuclear weapons from its territory and ship them to Russia. The contracting parties to the Memorandum agreed to respect the independence, sovereignty and existing borders of the Ukraine, refrain from the threat of or use of force against the Ukraine, refrain from the use of economic pressure against the Ukraine and in addition there were other guarantees covering the threat or actual use of nuclear weapons against the Ukraine. This should have secured the Ukraine against external threats, but, as we know, it did not.

## The Road to War

Viktor Yanukovich was inaugurated as President of the Ukraine on February 25, 2010. In April 2010, the Yanukovich administration pushed a bill through parliament that extended the Russian lease on

tion agreement with the EU in November 2013 in favour of forging closer links with Russia. It was this that started the Euro-maidan protests that eventually toppled the Yankovych government, which in turn led to the loss of the Crimea and the outbreak of Civil War.

Bear in mind that Russia had signed the Budapest Memorandum and the Treaty of Friendship, Cooperation, and Partnership and that both recognised and guaranteed the national independence and sovereign territory of the Ukraine. It would seem that Russia had wanted to turn the Ukraine into a client state with the Yankovych government acting as the public face of the operation. When Yankovych fled to Russia after the revolution, Moscow decided that the only option was direct action and decided to seize control of the Crimea as an overture to the secession of the Eastern Ukraine.

Russia had learned the lessons of its intervention in Georgia to support separatist movements in Abkhazia and South Ossetia in August 2008; it had the plans and military assets in place and was thus able to react rapidly to the evolving situation in the Ukraine and achieve its initial objectives.



**Ukrainian troops on a training exercise with a BMP-2 IFV. Lightly protected IFV systems such as the BMP-2 have proven to be incredibly vulnerable in combat operations in the eastern Ukraine. As yet no real alternative protected mobility options have emerged, despite private domestic industry capabilities outside Ukroboronprom.**

Sevastopol naval base until 2042. Then in June of 2010 it was decided that the Ukraine would cease efforts to become a member of NATO. It was quite clear that the Yankovych was tilting towards Moscow in terms of foreign policy and that his government could be successfully pressured by Moscow. The ultimate recognition of these facts came when the Yankovych government backed away from signing an associa-

In contrast the Ukraine found itself unable to react in the initial period of the conflict; its readiness was low, there had been no expectation of or planning for conflict, and reaction and response from the Ukrainian political and military leadership was too slow.

It is also important to remember that the international community has lessons to learn from the initial period of the Ukraine crisis.

Security guarantees had been given to the Ukraine, they were implicit in the Budapest Memorandum, and yet there was no constructive response to aggression against the Ukraine. It is only now, some 42 months after the start of the conflict, that the US has suggested that it might supply defensive weapons to the Ukraine! Sadly, even the shooting down of a Malaysian Airlines Boeing 777 on 17 July 2014 by separatist forces over the Donetsk oblast with 298 fatalities (flight number MH17 flying from Amsterdam to Kuala Lumpur), failed to stimulate the international community to take concrete measures to bring the conflict to a halt.

As to the situation of the Ukrainian military in 2014, on paper it might have looked rather formidable, but in reality the situation was very different. The military had been underfunded for years and its readiness was extremely low. While the Yanko-

Thus the industry had to focus on survival and this required an emphasis on exports at any cost to acquire funding.

The lack of preparedness of the Ukrainian military and the neglected state of the Ukrainian defence industry would have extremely negative consequences as the conflict in the Donbass unfolded. As the Ukraine got its act together and started to successfully confront secessionist forces in the Donbass, its task became even harder, as Russian troops and equipment were introduced into the conflict to support the secessionists. Consequently the intensity of the conflict grew, as did the level and quality of the threats being faced.

The fact that the Ukrainian government was involved in a real war would act as a catalyst for reform and reorganisation in both the military and the defence industry. This is a process that is still ongoing. The availability of more funding saw equip-

the Ukraine one significant weakness was the lack of modern anti-tank missiles in significant numbers, as their capabilities in this area had been allowed to atrophy.

Tanks have been very important in the conflict, and it became very clear that it was necessary to upgrade protection to deal with a range of threats. Later, the arrival of more sophisticated vehicles on the battlefield, such as the T-72B3, underlined that the Ukraine had to improve the fire control systems on its own tanks and look to enhance the penetrative capabilities of the main armament. Artillery has proven to be very important in this conflict, with Multiple Launch Rocket Systems (MLRS) in particular demonstrating how devastating they can be: the ability to mass MLRS fires is an area where Russian artillery has shown itself to be very capable. Tube artillery has also played an important role in both traditional and more unusual ap-



**A Ukrainian Army air defence unit prepares its ZU-23 twin 23mm anti-aircraft artillery systems for a range session in June 2017. This gun system provides a useful capability against UAV targets, as well as extra firepower to support ground combat operations.**



**An expedient solution to obtaining more firepower and mobility, a ZU-23 twin 23 mm anti-aircraft gun mounted on an MT-LB armoured vehicle in the Ukraine. Note the condition of the vehicle: the Ukrainian military has suffered from years of underinvestment.**

Photos: Ukrainian Ministry of Defence

vych government was prepared to lavish resources upon internal security it had little interest in the military, and added to which the need to acquire foreign currency saw much first-line equipment sold internationally and not replaced. For years the Ukrainian military had been asset stripped of much of its best equipment, with very little, if any, of the money gained from these sales ever finding its way back as reinvestment in the military.

Lack of investment in the military also had negative effects on the health and well-being of the Ukrainian defence industry. In the Soviet era the Ukraine had been one of the most important centres of defence production. However, after independence the defence industrial base in the Ukraine found itself in an extremely difficult situation and the necessary reform and reorganisation of the industry did not take place.

ment taken from storage, refurbished and/or modernised and then deployed with the military. The industry also found itself with significant domestic orders for the first time and had to respond by ramping up production to meet these new demands. The conflict has also led to innovation within the military and industry, as they respond to operational experience and evolving needs. In a military context the conflict in the Eastern Ukraine has offered up some important lessons, some new and some reinforcing existing knowledge. The importance of UAV capabilities became readily apparent, this was an area in which the Ukraine was weak, and they had to develop a capability extremely rapidly. Russia proved itself adept at cyberwarfare, information warfare and more traditional electronic warfare tasks, attacking Ukrainian networks and communications infrastructure. For

plications, for example artillery in a direct fire role.

As things stand at present, there is no likely solution to the conflict in the Eastern Ukraine and by implication the restoration of the territorial integrity of the Ukraine. Even if the Ukraine marshalled all of its resources to take military action to end the secession in the Donbass, it could not prevail, as Russia would support its clients in the Donetsk and Luhansk oblasts. The Ukraine must continue to be prepared to hold on to the territory it already has and must look to diplomatic means to find a solution to the situation in the Donbass. What the events in the Ukraine since 2014 reinforce is that a country must have a military that is capable of providing a credible deterrent and that countries should be very wary of relying on security guarantees from others. ■



# CBRN Defence and NATO

**Dan Kaszeta**

Since the earliest days of the North Atlantic Treaty Organisation, its members have worried about chemical, biological, and nuclear warfare. Indeed, the nuclear context of the collective defence alliance has been an important component of NATO for decades. However, from a defensive standpoint, all of the NATO membership, old and new, has worried about being able to protect their members from CBRN threats and see that their forces can operate on the CBRN battlefield.

CBRN defence manifests itself in many different ways within NATO. CBRN defence has been part of the military landscape that NATO first inhabited. While the risk of widespread chemical, biological, or nuclear warfare on NATO soil has greatly reduced since the end of the Cold War, it has not abated entirely. The post-Cold War era has seen the rise of both out-of-theatre activity for NATO members, both collectively as part of NATO actions and individually. Likewise, the threat of CBRN use by non-state actors has risen in the past few decades.

Many associate NATO with bureaucracy, and this is certainly evident to any who have had dealings with NATO entities. However, bureaucracy is not without value, and "NATOcrats" have done some useful things. Interoperability and standardization are critical to multinational operations. The longest-standing NATO contribution to CBRN defence is in standardisation. NATO has been in the common standards business since the beginning, and there are few, if any, CBRN manu-



Photo: SHAPE

**A Danish soldier searching an area for a possible biological agent: The 14th edition of Exercise Precise Response was held at Canadian Forces Base Suffield in Alberta in July 2017.**

als in NATO countries without copious reference to standardisation agreements (STANAGs), Allied Technical Publications (ATPs), Allied Engineering Publications (AEPs), various "Triptychs" (as the name suggests, three part documents) and related documents. These documents even permeate beyond NATO members and elements of them find use in places like Sweden and South Korea. NATO standards often become industry standards by default, as contractors and vendors want to do business in NATO member states, which represent the most lucrative segment of the world defence market. For serving military personnel, one of the most visible NATO standards in CBRN has been the respirator filter. There is a standard 40mm threading for CBRN respirators, now in widespread use around the world, not just in NATO members. This is clearly an area where a NATO standard becomes an industrial standard, or at a minimum, an option in a product line. Even the newer filters and masks which do not use the 40mm threat (e.g. the US M50 mask, the UK General Service Respirator) are part of the NATO framework

provided by Allied Engineering Publications 54 and 73 standardise these newer designs of respiratory protection as well. Another aspect of CBRN defence where NATO standards have had a concrete impact is in the field of warning and reporting. Allied Technical Publication 45 is a comprehensive methodology for calculation of the hazards generated by CBRN attacks. ATP-45 forms the basis for much of what CBRN officers and NCOs learn in their formal military education, even if they did not (as I did) realise it at the time. It provides a common, interoperable, and importantly – manual and un-reliant on computers – system for calculating the extent of hazards and communicating these hazards in ways that any NATO country can interpret. A Dane and an Italian will both interpret an "NBC-2 Report" in the same fashion. Once paper-based (and still possible with pencil and paper), ATP-45 has migrated into electronic form and is used in automated warning and reporting software.

In terms of both actual physical infrastructure and bureaucracy, NATO now has a Joint CBRN Centre of Excellence

## Author

**Dan Kaszeta's** career spans 25 years in the defence and security sectors. He has served as an officer in the US Army Chemical Corps and as a civil servant in the White House Military Office and US Secret Service. He moved to the UK in 2008 and after three years at Smiths Detection has been working as an independent consultant and writer. He is the author of "CBRN and Hazmat Incidents at Major Public Events" (Wiley, 2012) and numerous articles, primarily in CBRN defence.



Photo: JCBRN Defence CoE

**Over 200 attendees from seven countries participated in the NATO multinational exercise CLEAN CARE 2016 that was conducted at the military training area Tisá, Czech Republic, from 19-23 September 2016.**

(CoE), hosted by the Czech Republic in Vyškov. Established in 2007 and generally led by a Czech CBRN Colonel, the CoE is typically staffed by military and civilian staff and support from at least 12 NATO members. The JCBRN CoE is organised into three departments. The Transformation Support Department works much as a CBRN staff in a large military headquarters would do, incorporating CBRN elements into NATO doctrine, publications, and planning processes. The Training, Education and Exercise Department, not surprisingly, leads and manages a training and exercise programme, provides mobile training teams, manages a "lessons learned" system, and works to integrate CBRN concerns into other NATO exercise programmes. The Operational Support Department has a CBRN reach-back section to provide technical support to NATO members, a capability declared fully operational in 2016. There is an Operational Planning Support Section to support NATO crisis response and operations planning efforts, and a Modelling and Simulation Section. This NATO Centre of Excellence is a valuable example of NATO CBRN capability, and it aggregates expertise that might be very well dispersed and diluted across Europe.

The NATO programme of exercises is an important component of overall readi-

ness, and the exercise effort has received new emphasis since the establishment of the JCBRN CoE. One example of many is PRECISE RESPONSE 2017, which was recently held at Canadian Forces Base Suffield, Alberta. This year's iteration was 14th in the series. This exercise uses Canada's ability to train with live toxic materials and involves 400 personnel, from 10 NATO and Austria, which has been a NATO "Partnership for Peace" member since 1995. Another example was CLEAN CARE 2016, which exercised decontamination and medical care capabilities. Hosted in the Czech Republic, it included participants from 7 NATO countries. NATO has a decades-long tradition of "ready" "rapid" "response" "standing" and "alert" forces, some of which did not deserve the adjectives applied to them. Battalions, brigades, groups of ships, even whole army corps have been designated as NATO forces. In the CBRN arena, there is now a NATO Combined Joint CBRN Defence task force, created in 2003. This Task Force is composed of a Joint Assessment team and a Multinational CBRN Defence Battalion. The Joint Assessment Team is small, but agile, capable of providing rapid assistance to assess situations. The Battalion is structured as a traditional military CBRN defence battalion. In reality, since the Battalion has existed for many years now, it has

been many battalions, as its members are typically drawn from 8-10 member states and the various components serve in 6 month rotations. The Battalion is heavily slanted toward detection and decontamination, and consists of a reconnaissance company, a light decontamination company, a heavy decontamination company, deployable laboratories, a medical component, and a headquarters element. To date 21 NATO members have contributed equipment, soldiers, and leaders to the Battalion or Joint Assessment Team. A non-NATO member, Ukraine, contributed a decontamination platoon in 2010. The process for certification to become part of the Battalion has been a valuable tool in increasing the readiness of CBRN units across NATO. The Battalion's role as a rapid response entity for domestic support is a bit questionable, given its stated readiness time to be deployed with 5 to 20 days. However, support to major events and heightened alert status are both eminently possible. A task force from the Battalion supported the 2004 Athens Olympics.

Extension of NATO's work from the military sector into civil preparedness has always been more mixed than its military work. However, there is now work underway by the Civil Emergency Planning staff at NATO, which includes a "Civil Protection Group" that is attempting to address civilian emergency services response to CBRN incidents. For example, NATO has put forward a suggested international CBRN training curriculum for emergency services involved in civil protection. It must be said that this is clearly a "lowest common denominator" product, but it is certainly a move in the right direction. Furthermore, NATO has yet to fully get to grips with the fact that many civil accidents involving hazardous materials are, in practical ways, often the same or similar to CBRN warfare.

As NATO is an organisation with 29 member states and numerous partnership arrangements, it is useful to remember that the vast majority of CBRN operational capacity resides at national level. While a detailed encyclopaedia of CBRN capability and capacity would be a lengthy effort, it is useful to highlight some of the specific CBRN competencies that NATO members can (and often do) contribute to NATO.

The United States has always been the biggest provider in NATO. Since the end of the Cold War, the US Army Chemical Corps's footprint of traditional military CBRN units in Germany has been greatly reduced. However, there have been in-



interesting developments. The US Army maintains a WMD Civil Support Team in Kaiserslautern, Germany. This is an asset for military support to civil authorities in the event of CBRN or similar incidents. All of the other CSTs, over 50, are National Guard assets for domestic use in or near their home states. This one, the 773rd CST, is for use in Europe, not just in and around US bases, or even just within NATO members. Indeed, the author, who once was a CST member in Maryland, witnessed a 773rd CST training deployment to Switzerland in 2012. In addition, the US Defense Threat Reduction Agency has a significant forward presence in the European theatre, also in Kaiserslautern, Germany.

Even a cursory survey of other NATO countries yields useful capabilities. Canada and the Czech Republic both can contribute the ability to safely train with actual chemical warfare agents. The Czech Republic hosts the CBRN CoE and Multinational Battalion for good reasons as it has a very strong practical and theoretical basis in military CBRN defence. Various NATO members have battalions or regiments of CBRN troops with reasonably good reputations. Germany and the United Kingdom are the industrial heart of

detection and identification technology. Germany (again) and Italy are Europe's leaders in decontamination technology. Slovakia and Poland have interesting technical niches in detection. Croatia hopes to lead in putting CBRN detection onto unmanned systems. Denmark has industrial capabilities in sensor integration, warning, and reporting. Spain has set up a CBRN unit (the Valencia Regiment) and grown its capabilities since its establishment. The German army has long had a well-respected chemical corps. The UK, Norway, Poland, and the Netherlands, among others, have excellent laboratories to support agent identification and forensics. Albania, a newcomer in NATO, has recent history of dealing with legacy chemical stockpiles. Belgium and France are veterans at dealing with First World War chemical ammunition, which still turns up in farmers' fields from time to time. All of this experience and ability adds up, but needs coordination in order for it to be useful across NATO.

Finally, no broad survey of the NATO countries should omit the deficits and gaps that exist. Most members neglected CBRN defence in the immediate aftermath of the Cold War, and the pendulum has swung back towards preparedness

at different rates in different places. Few NATO members are truly ready to address the issues of CBRN forensics, contaminated evidence, and prosecution of terrorist offences involving CBRN materials. Some NATO members, such as the Baltic states and Montenegro have militaries that are simply too small to have widespread scope for CBRN capability, despite having some individuals with excellent CVs. Others have neglected CBRN defence for reasons of budget. For example, the United Kingdom went through a period where its army did not have a CBRN unit, CBRN defence having been relegated to the Royal Air Force. In other cases, CBRN doctrine remains mired in cold war scenarios and has not adapted to the modern battlefield. The author's own experiences in Romania, Bulgaria and Poland have unearthed instances of Soviet-era dogma that simply will not abate. However, no NATO country (save Iceland, which has no military) is bereft of military CBRN capability, but none of them does it perfectly either.

However, the positives seem to outweigh the negatives. NATO, both individually and collectively has built institutions and capabilities. The overall trajectory is upward not downwards. ■



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# 2018 US Defence Budget Proposal Restoration

As a final budget deal is debated, top acquisition priorities remain unchanged

**Joshua Cohen**

The US President's US\$639.1Bn defence budget proposal awaits approval from a Congress reluctant to move on the administration's plan to finance the armed forces. At US\$52Bn above a spending limit imposed by the Budget Control Act of 2011, the figure has been criticised as insufficient to restore warfighting readiness, degraded by frequent combat rotation, reduced equipment inventories and munitions stockpiles. Compounding the issue, years of sequestration funding levels have delayed aircraft and ground vehicle refurbishment and modernisation. While top service priorities are likely to survive ongoing budget negotiations, funding lines in the final document may not align with President Trump's original plan.

The Navy's US\$171.5Bn proposal includes US\$30.4Bn for new shipbuilding and maritime systems, representing the largest portion of the service's acquisition budget. The amount provides for eight new-construction ships, including US\$1,880.7M in advance funding for the service's future nuclear-powered aircraft carrier, CVN-80 ENTERPRISE. Also set aside, US\$1.8Bn for procurement of long-lead items for COLUMBIA class nuclear ballistic missile submarines (SSBN-826). The final pair of Block IV VIRGINIA (SSN) class nuclear-powered fast attack submarines are funded at US\$5.2Bn. Part of a ten-hull multi-year procurement, two Flight III ARLEIGH BURKE guided missile destroyers (DDG-51) are included. Funding for a single Littoral Combat Ship is provided, leading to some doubt about the programme's future.

Allocations for non-combatant fleet assets include US\$541M for a construction of a JOHN LEWIS class fleet replenishment oiler (T-AO), second of a planned 20. Approximately US\$76M will be applied to a new class of towing, salvage, and rescue ship (T-ATS). Based on a mature commercial design, using off the shelf technology proven in the oil and gas industry, the new class will replace the Navy's aging POWHATAN (T-ATF 188) and SAFEGUARD class (T-ARS 50). A US\$1.25Bn -line item expected to remain in any final budget, 14 new F/A-18E/F Super Hornets are needed to address the service's strike fighter shortfall. A result of excessive use and reduced maintenance, unavailability is reportedly running between 50-75% of the Navy's

inventory. Emphasising the growing capability gap, an additional 10 SUPER HORNETs top the service's FY-18 list of unfunded priorities. According to Congressional testimony, the service originally intended to zero out funding for new F/A-18E/F aircraft. As part of the Future Years Defence Programme, 80 are now planned. Joining the new HORNETs, four F-35C JOINT STRIKE FIGHTERS and six CMV-22B OSPREYS, replacing 1960's era C-2 GREYHOUND Carrier Onboard Delivery (COD) aircraft are fully funded. At US\$137Bn, a seven billion increase over the FY-17 budget, the US Army's base allocation will have to be stretched far to support an end strength of 1,018,000 troops authorized in 2017. The figure is expected to fund equip-

Image: US DoD



**Artist impression of the USS ENTERPRISE (CVN-80). The US Navy's proposal includes US\$1,880.7M in advance funding for the service's future nuclear-powered aircraft carrier.**

## Author

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Photo: US Air Force

***The F-35A LIGHTNING II fighter programme continues to be a top priority, with funding for 46 aircraft in the budget.***

ment modernisation accounts, long neglected due to sequestration mandated cuts, while simultaneously supporting the introduction of systems and capabilities to keep pace with offensive capabilities now available to many nations. In a May briefing, Major General Thomas Horlander, the Army's budget director, outlined his service's modernisation priorities. Horlander said air and missile defence represent the service's number one priority. The service needs modern means of countering enemy area denial and anti-access capabilities as potentially hostile nations field increasingly modern weapons systems. Upgrades include software modification kits for 131 MIN-104 PATRIOT Advanced Capability 3 (PAC-3) missiles. Shoring up short range air defences, acquisition of additional AN/TWQ-1 Avenger systems will defend ground forces from unmanned aerial vehicle and cruise missiles attacks. A product improvement and service life extension programme for FIM-92 Stinger man-portable air defence systems will be accelerated. Replacement of dated components and a new proximity fused warhead are expected to keep the inventory relevant for another decade. Upon completion, the MANPAD will be redesignated FIM-92J.

Increasing long-range fires capability is another priority, one comprising a ten-year service life extension for 121 expired Army Tactical Missile Systems (ATACMS). Additionally, 6,000 rockets will be ordered for the Guided Multiple Launch Rocket System (GMLRS). Production of 88,000 unguided HYDRA 70 rockets and 480 M982 EXCALIBUR GPS-guided 155mm artillery munitions round out key priorities. The service's aviation component will receive one billion dollars to

purchase new and remanufactured 48 UH-60 BLACKHAWK transport helicopters. Joining these, a combination of 62 new and remanufactured AH-64E APACHE LONGBOW attack helicopters will be purchased with US\$939M. Heavy lift assets get a boost with funding for six rebuilt CH-47F CHINOOK cargo helicopters. For ground troops, acquisition of 2,110 Joint Light Tactical Vehicles is budgeted at US\$804M. Another US\$772M is allocated for procurement of new and modernised PALADIN 155mm self-propelled howitzers. Major investments are planned to modernise M1 ABRAMS tank and M2 BRADLEY infantry combat vehicle inventories.

The Air Force requested US\$132.4Bn for a budget that invests primarily in personnel; readiness, nuclear deterrence operations, space and cyber capabilities, combat units and infrastructure. According to the service, the fifth generation Lockheed Martin F-35A LIGHTNING II fighter programme continues to be a top priority, with funding for 46 aircraft in the budget. A US\$915M request covers planned modernisation, reliability and improved maintainability upgrades for service's F-22 fifth generation superiority fighter. Funding includes integration, development and testing for the AIM-120D and AIM-9X air-to-air missiles, and enhanced electronic warfare protection. Upgrades will give the RAPTOR a ground attack capability using the GBU-39 Small Diameter Bomb.

The long serving F-15E STRIKE EAGLE inventory is programmed to receive US\$931M in improvements, allowing the 1970's vintage design to remain in service until the 2040 timeframe. The inventory will see new radar, electronic

warfare, infrared search and track and computing power upgrades. Weapon carrying capability is also set to increase from 12 to 16 hardpoints, new software will enable deployment of a wider range of munitions. Orders for transport aircraft are limited to an existing multi-year procurement for five special operations MC-130J and two HC-130J. Funding lines have been established to support continued A-10 attack aircraft operations as the service now expects to keep the type operational until 2022. The aircraft, with questioned ability to successfully operate in a modern air defence environment, have seen major upgrades over the past decade. Among these, a wing replacement and cockpit overhaul intended to keep the aircraft in service until 2030 were completed.

Providing deterrence and a counterforce to provocative displays by the Russian armed forces, the European Reassurance Initiative (ERI) is programmed to receive US\$4.8Bn, a US\$1.4Bn increase over 2017. During a 1 June press briefing, Major General David W. Allvin (USAF), European Command's director of strategy, explained the additional funding supports an increased presence. He said US\$2.2Bn is earmarked for 'enhanced' prepositioned equipment, munitions, fuel and support activities. The Army's FY-18 budget request includes US\$253.9M from the FY-18 Overseas Contingency Operations account, these funds will purchase 65 new Armored Multi-Purpose Vehicles in a one-off deal specifically to support US forces participating in ERI. Also included in the FY-18 budget proposal, US\$150M to continue efforts to train, equip and advise Ukrainian government forces for internal defence operations. ■

# “We are actually working to reach the objective of 2%.”



Photo: MoD Spain

**Succeeding Pedro Argüelles, Agustín Conde took office as the new Secretary of State in the Spanish Ministry of Defence on 19 November 2016. ESD spoke with him about his assessment of Spain's current defensive capabilities and his near and medium-term plans and perspectives.**

very soon after her taking office. They involve several matters like human resources policy, budgeting, infrastructures, new acquisitions, maintenance, peacekeeping operations, etc.

If we focus the answer on this department, our main goal is to provide for the women and men serving the country in the military the best tools available, so they can perform their duties. Our armed forces have at their disposal world-class weapon systems and are supported by an excellent industrial base.

However, it is well known that Spain has suffered significant budget restrictions in previous years. It is also true that we all have contributed to the economic recovery of our nation. Now our intention is to

work with the entire Spanish society and the political parties to agree on a new cycle of investment, so that our personnel can count on the best weapon systems in the future – equipment, gear, facilities and supplies – to perform the tasks that have been assigned to them.

**ESD:** With 0.9% of the country's Gross National Product in Spain's 2016 defence budget – similar to those of many other NATO nations – was significantly below the

**ESD:** The Council of Ministers of the Spanish Government approved your appointment as Secretary of State for Defence at the end of November 2016. What is your professional background, and what are your priority objectives in your new and current position?

**Conde:** The priority objectives of the department were clearly stated by the Minister of Defence, Maria Dolores de Cospedal,

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Photo: MoD Spain

**Spain participates in the NATO Force Integration Unit (NFIU) in Latvia.**



2% level advocated by NATO. Now that US President Donald Trump has threatened a reduction of the US' military support to the protection of NATO Europe, do you expect this figure to change – and if so, when and to what extent?

**Conde:** The Minister of Defence, Maria Dolores de Cospedal, emphasised during her official statement in the National Parliament that it was the intention of this Government to fulfil all necessary conditions and steps to obtain an increase in the defence budget.

However, it is also significant – as she clearly indicated – that this objective can only be achieved with a national agreement involving all political parties represented in Parliament. We are actually working to reach this objective.

**ESD:** Considering the current status of the Spanish Armed Forces in terms of personnel and education, infrastructure, efforts required for maintenance and life cycle management, and equipment in service and subject to procurement, are there areas where you see need for improvement?

**Conde:** The Department within the Ministry of Defence which I have the honour to be the head of, is in charge of budget-

ing, infrastructure and new acquisition of weapon systems, so I am giving my answer from this perspective.

ously the different scopes of action are well defined by our constitution and legal system. However, it is clear that cooperation



Photo: MoD Spain

*The Spanish frigate VICTORIA during a rescue mission off the shore of Libya in June 2017*

There is always room for improvement. It is our mission to secure our freedom of action as a country, to guarantee our sovereignty and the safety of our citizens. The

need for new investments for equipment and infrastructure, it is a must for every nation. To keep the armed forces fully trained, with the best equipment, to deal with the growing threats in the globalised world in which our citizens develop and exercise their rights, it is our main objective.

We have to ensure the best personal safeguard for the women and men serving in the Army, Navy and Air Force, so they can accomplish their mission, which is the protection of Spanish citizens in any type of mission, in any scenario, present and future.

**ESD:** In light of the new threat environment characterised by terror and asymmetric threats, can you elaborate on the distribution of responsibilities and cooperation between the Armed Forces and paramilitary forces like the Guardia Civil?

**Conde:** All departments are responsible for the security and safeguarding of our democracy and freedom. Obvi-

ously the different scopes of action are well defined by our constitution and legal system. However, it is clear that cooperation

**ESD:** We understand that some of your current capital defence materiel programmes are also intended to strengthen the Spanish defence industry. What is your perception of the capabilities of the Spanish defence industrial base?

**Conde:** The industry is the essential actor to respond to the operational needs of the armed forces with viable industrial and technological solutions for the equipment and systems that we need as a nation.

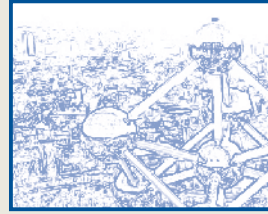
Innovation is the key strategic element to achieve and implement high-end technology. It is the essence of all growth and development. Creativity is the key element that enables more efficient and operational solutions. It solves complex problems and introduces improvements that redound to the benefit in our society.

A broad technology base is key if it comes to generating a credible deterrent factor. Investments in research and innovation are indispensable elements to maintain our sovereignty and freedom of action and, in case of a military conflict, attain the supremacy in defence of the interests of Spain and its allies. In this respect, Spain can take advantage of a very capable defence industrial base, fully engaged to provide high-tech solutions for the needs of our forces.

**The interview was conducted by Esteban Villarejo.**



# The Brussels Backdrop



## The European Migration Crisis

**Joris Verbeurgt**

In 2011 a revolution broke out in large parts of North Africa and the Middle East. From Morocco in the West to Syria in the East, the Arab Spring raged alongside Europe's southern borders. In some cases, the street protests were easily suppressed by a mixture of concessions and repression. In other cases, popular upheaval led to armed rebellion aiming at nothing less than producing a regime change. The latter scenario was the case in Libya and Syria where "rebels" tried to overthrow the regimes of Muammar Gaddafi and Bashar al Assad. With the support of NATO and some EU countries, Gaddafi was soon driven from power and assassinated. Assad, backed by Russia, was a tougher nut to crack. The attempts to overthrow these (semi-)dictatorial regimes, disliked by some Western and Arab powers, led to gruesome civil wars, instability, the spread of IS and - especially destabilising for Europe - to streams of refugees pouring into Europe and to a highly increased risk of terrorism on European soil. Already in March 2011, in an interview with the France 24 television station, Gaddafi predicted the greatest refugee crisis in Europe since WWII when he warned that millions of Africans would come to the Mediterranean to cross to Europe if Libya was to become unstable. On more than one occasion, Assad warned European leaders that the war in Syria and the uncontrolled influx of hundreds of thousands of "refugees" into Europe would make this continent extremely vulnerable for terrorist attacks committed by IS and its supporters.

### The EU's Open Door Policy

Both prophecies turned out to be true: Western-European countries were the target of numerous terrorist plots and atrocities (Nice, Berlin, Brussels, ...), killing and wounding hundreds of European citizens and necessitating a variety of emer-

Photo: Frontex



**A total of 26 EU countries have taken part in Frontex' Joint Operation Triton by deploying either equipment or border guards.**

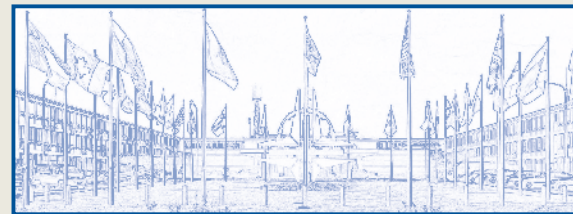
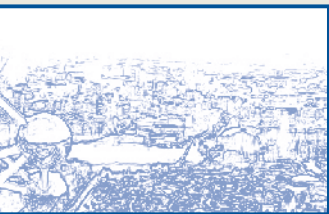
gency measures, like the army patrolling the streets in major cities. Since the fall of Gaddafi and the start of the Syrian conflict in 2011, approximately 4.5 million asylum seekers have entered Europe, with peaks of 1.3 million in 2015 and 1.2 million in 2016 (source: Eurostat).

Most asylum seekers entered Europe via the Mediterranean Sea: in 2015 and 2016, more than two million migrants entered Europe via the Eastern Mediterranean route, coming from Turkey to Greece with the aid of human traffickers. Thousands of migrants, attracted by Angela Merkel's famous words "Wir schaffen das", drowned during the crossing. The traffickers have also other routes available: the Western Mediterranean route leading to Spain, the Central Mediterranean route leading to Spain and Italy and the Southeastern Mediterranean route leading to Italy. From their arrival point in Europe, the migrants seek to get to Northern European countries, like Germany, Sweden and the Netherlands, where they hope to find refuge and finally

the status of asylum seeker. Once they get in these countries, they are pretty sure they can stay there and will not be removed. After some time, they can bring over their families and new legal migration channels emerge. The Schengen agreement that provides free passage from one European country to another, makes it all easier.

First, the EU welcomed the migrants for humanitarian reasons and because EU officials believed that the migrants were highly-skilled workers, an asset for the European workforce. Germany and Sweden lead by example, letting in huge contingents of migrants at once. However, soon the problems began: Sweden was so overwhelmed by the influx of migrants that it was forced to temporarily close its borders. Germany, too, experienced a reality check after new year's eve 2016, when gangs of young migrants harassed and assaulted German women in Cologne and other places. It turned out that a large majority of the migrants that were welcomed with open arms were young males and not fam-





ilies with children; that only few possessed the skills needed by the European industry and that most migrants would probably live on the already burdened social welfare system. Only a small minority was actually fleeing war or fearing for their life: most migrants came from places as far as Nigeria and Bangladesh (!) in the search for a better life. The migrants have kept coming, billions of tax payers' money have been spent on housing and support of migrants, crime rates – especially rape - skyrocketed, women have been harassed at festivals, ... and in all European countries, the public opinion has turned against the open borders policies promoted by Germany, the EU and Western media.

## National Responses to the Migrant Crisis

Hungarian Prime Minister Orbán was the first statesman to understand what was going on. Together with Poland, the Czech Republic and Slovakia (later joined by Austria), he rejected the open borders policy and started to build a fence along his borders to prevent the trespassing of thousands of migrants per day. The EU reacted half-heartedly: it condemned the fence in Hungary but in March 2016 it closed a (costly) deal with Turkey to exchange large numbers of migrants. At the same time, it established the European Border and Coast Guard Agency to tackle migration and security challenges at Europe's external borders by conducting stress tests and identifying vulnerabilities before a crisis could hit. Since 2015 Frontex has conducted two maritime operations in the Mediterranean, Poseidon for Greece and Triton for Italy, with the goal of controlling the influx and saving the lives of migrants risking the passage. These measures were accompanied by a plan to equally spread large numbers of migrants over all EU member states; the compulsory nature of the plan, especially striking Central- and Eastern European nations that hitherto had no large Muslim communities living in their country (and refuse to have so), fiercely opposed the plan and continue to do so. The question of the resettlement of refugees has become a very divisive subject in the EU.

EU officials (pressed by Germany) opted for a strategy aiming at controlling the migration streams instead of trying to stop them; a push-back policy – forcing intercepted boats with migrants to return to the harbours in North Africa and Turkey where they originated from – was repudiated; a proposal to set up camps in North Africa where migrants could apply for asylum and only those eligible for asylum (actually a mere 2%) could come over, was also rejected.

With IS almost defeated in Syria and migration from Turkey to Greece becoming a lot more difficult, human traffickers quickly found other routes to land their human load on European soil in exchange for big cash. In the spring of 2017, Libya – showing many traits of a “failed state” – became the primary operating base for the smugglers and Italy its prime destination. While in the first half of 2017 around 60,000 migrants arrived in Italy, in the four days between 24 and 27 June, 8,863 migrants came ashore, according to the International Office for Migration. Since the beginning of 2017, more than 1,500 people have been reported to have died during the crossing from Libya to Italy. At this rate, Italy may well exceed last year's record of 200,000 arrivals. The nationality of the migrants raises important questions about how Europe is handling the migration crisis: Nigerian is the first declared nationality of around 15% of those arriving in 2017, followed by Bangladeshi (12%), Guinean (10%) and Ivorian (9%) – all countries without war and thus making the migrants not eligible for asylum status.

## Another Strategy is Needed

Another aspect is the role of the NGOs operating in the Mediterranean Sea: many of them act as an extension of the human traffickers, taking over the migrants from the smugglers as soon as they leave the coastline and transporting them to Italy. The Italian Department of Justice is investigating the contacts between certain NGOs and human traffickers since human trafficking is a crime and complicity to it punishable under law. EU and NATO maritime operations in the Aegean Sea – picking up thousands of migrants at sea and bringing

Photo: NATO MARCOM



**NATO ships patrol the western Mediterranean in the scope of Operation Sea Guardian.**

them safely on land – were also criticised for providing a de facto ferry service for human traffickers.

The EU pledged for solidarity with Italy more than once but with little to no effect. The Italian authorities therefore decided to take matters in their own hands and negotiated an agreement with Libyan authorities to prevent human trafficking from Libya. Italy sponsors and supports an effective Libyan Coast Guard that prevents the boats with migrants to set off in the direction of Europe. At the same time, the Italian Government imposed a code of conduct for so-called rescue ships chartered by NGOs. Several NGOs – Doctors Without Borders is among them – refused to sign the code and quit their activities at sea. Data show that migration from Libya to Italy dropped at once but that the migration routes easily transfer from one place to another and that the whole Southern European coastline is at risk. As we write this, large quantities of migrants are arriving in Spain, just a couple of miles off the coast of North Africa. The migrant crisis is far from over but has made one thing clear: the EU has no strategy that is supported by the member states or by the European population. It has no executable plan to prevent the uncontrolled influx of migrants and countries like Hungary and Italy have to rely on their own capabilities to prevent the migrants crisis turning into an explosive political, social, economic and humanitarian situation. A change of course is therefore more than desirable.

# “This situation cannot go on.”



## Interview with Deputy Defence Minister of the Republic of Azerbaijan, Lt.Gen. Karim Valiyev

On 15 May 2014, the Azerbaijani President as Supreme Commander-in-Chief signed Presidential Decree № 466 in order to appoint Lieutenant-General Karim Valiyev (then 53) as the Deputy Defence Minister. Lt. Gen. Valiyev is a graduate of the Frunze Military Academy and served as the head of the Military Scientific Centre and the Chief of the Department of Defence Planning/Military Strategy of the Azeri MoD and was also Commander of the 1st and – up to his appointment – the IVth Army Corps.

**ESD:** General, could you please give us an overview on the general background of the defence forces of Azerbaijan, and how the forces see themselves? What is their spirit, motivation or morale factor?

**Valiyev:** You're openly welcomed. While the Defence Forces of Azerbaijan are, like many other armies, principally defence-oriented and committed to the defence of the motherland, it cannot be denied that in their motivation or morale they are of course up to today characterised by the more than 20 years of unresolved conflict on Nagorno-Karabakh and the accompanying illegitimate Armenian occupation of seven recognised Azerbaijani territories. It's our land. I am sure you are aware of the four UNSC-adopted resolutions – one of the main sources of international law – from 1993, regarding the Nagorno-Karabakh conflict. Resolutions Nos. 822, 853, 874 and 884 confirmed the occupation of Azerbaijan territories by Armenian armed forces and since then have called for the withdrawal of Armenian troops from Kelbajar, Agdam, Fizuli, Jabrayil, Qubadli and Zangilan. Additionally, the UN General Assembly adopted a resolution in 2008, reaffirming the territorial integrity of Azerbaijan and demanding the withdrawal of all Armenian armed forces from the occupied territories. So all these are recognized facts, upon which of course their liberation remain a nationally-enshrined goal.

**ESD:** Goals that also are shaping your military.

**Valiyev:** Not in terms of the general force-structure, policy-orientation or dislocation,

Photos: Mader



**Take-off of two MIG-29UB of the Azerbaijani Air and Air Defence Force at Nasosnaya air base**

but of course in the overall motivation or identity – for the whole nation, in fact, because the General Assembly in 2008 also reaffirmed the inalienable right of the Azerbaijani population to return to their homes. This affected more than a million people; many thousands – a new generation – are still living as domestic refugees and displaced families. Also, many thousands of our servicemen and -women come from these territories and everybody knows someone from families expelled from these regions or living under constant danger along the Line-of-Contact (LoC). As I am sure you know, there is a ceasefire in effect since 1994, but it's very fragile. And ever since then, the international community – or the chairs of the mediating “Minsk-group” (Russia, the US and France) – has not sent any clear signal to Armenia, unfor-

tunately. And – in opposition to the Vienna document which Yerevan also signed – there are hundreds of weapon systems and military vehicles still present on the territory of Karabakh and our occupied provinces.

**ESD:** It seems clear that this “frozen” conflict along your western borders dominates your security situation. Is there an outcome on the horizon, or is it for future generations to find a settlement?

**Valiyev:** Let me be clear. There is nothing frozen out there. This term comes from those who want such conflicts to last forever in order to keep their influence. Furthermore, this is anachronistic WWI-style trench warfare, but with NVGs and UAVs. Soldiers and civilians are killed almost every week or month; the latest technique is to drop explosives from small commercial



UAVs. It is the biggest threat to the region and its development, so the conflict has to be resolved, one way or another. We long pursued the so-called “Madrid Principles”, refined in December 2009 at the behest of Russia, the US and France. This proper plan – to be ‘worked down’ by the OSCE’s “Minsk Group” – would step by step have allowed for the return home of 750,000 internally displaced people, the restoration of communication links and the withdrawal of Armenian troops from the seven regions and villages surrounding Karabakh. An interim status would then be given to an autonomous Nagorno-Karabakh with security guarantees to enable an international peacekeeping operation, pending a later decision on the territory’s final status. This offered a fair way out of the current deadlock for both sides. It could have been the foundation of a breakthrough.

**ESD:** And...?

**Valiyev:** Well – in reality nothing happened. With regret we have heard nothing substantial from Armenia, except hefty words that these territories would never be Azeri again and so on. I mean, what does Armenia gain from that rhetoric? They cannot eat these lands! And what is Armenia’s status compared with Azerbaijan? Nothing. They are not along any financially relevant corridors or pipelines. Their economy is poor. Their people are scattered over the entire planet. There is an exodus of the young – especially from the occupied districts. We have a bigger defence budget than their entire national budget. Yes, it may be the case that since the 2008 Georgian conflict – another similar situation in the same region – Yerevan has closer relations with Russia after it recognised Georgia’s two breakaway regions. But for us, any compromise could never mean a secession of those territories to Armenia! It could be a co-existence of both ethnic groups there. What do we hear regarding this intermediate target? That it is “incompatible”

**ESD:** Did this situation lead to the short “April war” of last year?

**Valiyev:** No, we have endured this prolonged status for a painfully long time, from well before. But as I told you, there are weapon systems there, which simply should not be. And with infrequent barrages they threaten border villages and Azeri citizens, especially with artillery. When such shelling happened again last April, thanks to the counteroffensive conducted by the Azerbaijani armed forces, even some of the strategic heights occupied by Arme-



**About 100 MATADOR MRAPs and 140 MARAUDER APCs, both from the South African Paramount Group and produced in Azerbaijan, are in use with the Azerbaijan Land Forces.**

nia were liberated. They are well aware of Azerbaijan’s military superiority and that the military operations conducted on the frontline in early April have demonstrated the strength of our army to the whole world. And yes, we had casualties in this operation: each one will be painfully missed by families and comrades. They will be reflected in the memory of the Azerbaijani people and strengthen our confidence that by the blood of our martyrs the country’s territorial integrity will be restored. And you can be sure that we will avenge our martyrs’ blood. I wish that our flag will again be raised in our lands where our soldiers were martyred. Inshallah.

**ESD:** Since then have there been other clashes or shootings? I heard that in May you destroyed a mobile Armenian OSA [SA-8] air defence system?

**Valiyev:** There are almost daily shootings and explosions. Sometimes mortars. And sniper activity. The peak figure April of Armenian armed units breaking the ceasefire with Azerbaijan was a total of 112 times throughout one day. The OSA-system you mentioned, that happened in the Fuzuli region, in the southernmost part of the LoC. We knew it was there but when it was relocated forward to “paint” our helicopters, it was decided to destroy it.

**ESD:** With what? An anti-radiation-missile?

**Valiyev:** No, by a SPIKE missile from an armoured vehicle.

**ESD:** Isn’t it the case that your government portrays last April as proof that it can change the status quo on the ground in its favour? Would you now be encouraged to use the military option if faith in the diplomatic process fades?

**Valiyev:** No. The diplomatic process remains the preferred path. But on the other hand, this situation cannot go on endlessly for another generation. Also because over time the threat develops a new “quality” or dimension – such as there are now IS-KANDER missiles in Armenia that threaten even our capital.

**ESD:** Is that why Azerbaijan agreed with Israel to get their IRON DOME missile defence system, BARAK-8 SAMs and the GREEN PINE radar...?

**Valiyev:** Of course we have taken steps to neutralise this threat. And – similar to other partners like our brother-nation Turkey – Azerbaijan has developed a deep military partnership with Israel in recent years; our defence industry has developed several joint co-operative projects with Israeli manufacturers. Logically, Azerbaijan has received many defensive and offensive weapons from Israel, or is assembling them in partnership. That also includes airspace and air defence.

**ESD:** Let’s now focus onto your forces, please. Could you elaborate on the general orientation of your military?

**Valiyev:** It’s unambiguous that Azerbaijan is in the process of integrating into NATO standards. While we study the experiences of different countries in the military sphere, including Russia, the Army however is continuously developing in accordance with NATO principles. It is not true to say that the Azeri Forces are inclined towards the former Soviet or Russian military model: such claims are baseless. We, for example, have over 200 servicemen studying in foreign countries, most of them in NATO nations. But we also have some in Russian military education institutions, which makes sense



**POLNOCHNY Class landing ship of the Azerbaijani Navy**

since we still use many Russian-built weapons and equipment. So we will always need some officers to study in Russian schools to familiarise themselves with those weapons and that equipment. But programmes of the Russian education system are not used in our tactical concepts or operational planning. Our NATO-orientation is documented by constant evaluations of our units...

**ESD:** Like that rapid mobile battalion we visited?

**Valiyev:** Yes, that NEL-2 (NATO Evaluation Level 2) was held within the framework of the NATO Operational Capabilities Concept (OCC) programme, in the Karaheybat Training Centre. About 700 soldiers,

80 military vehicles and 4 helicopters were involved in the field exercise. The evaluation was conducted by the multinational evaluation team and monitored by a NATO Monitoring Team representing Allied Land Command.

**ESD:** Finally, not too many foreign defence journalists have been to your country or to the different branches of your forces. Do you care for more media-visits or do you pursue a certain public-relations strategy?

**Valiyev:** Well you see, at least you are here! But not many like you, from your international colleagues. But while we use and respect your publication, it is only since 2014 that we have developed

an organization to work with mass media representatives. Before you interrupt – yes, your kind of magazines are not truly “mass media” – but in the light of modern information warfare, we need to deal with those professionally – also regarding things like security measures when taking them to the front along the LoC. Furthermore, this organisation develops general rules on how to work with media requests, basic directions and principles of media relations, rules for allowing journalists to military facilities and so on. In 2014 the first advanced training course for such Azerbaijani military personnel was completed. They gained knowledge and experience of how to work and build relations with media outlets, measures taken to develop regulations of accreditation in connection with the activities of media representatives in military units and institutions of the Armed Forces, organization of seminars with journalists specialized in military issues and their visits to military units, arrangement of press conferences and other activities. It is essential to show, more broadly and more openly – also beyond our borders – who our men and women in uniform are – while not forgetting about transmitting our message.

**The interview was conducted by Georg Mader.**

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# Viewpoint from Bern



**Peter Jenni**

## Protecting Swiss Air Space

In early 2016 the Chief Executive of the VBS (Swiss Federal Department of Defence, Civil Defence, and Sport) set up an internal and an external working group and issued them with instructions to determine what Switzerland will need in the future for monitoring, protecting, and defending its airspace.

The internal group of experts under the guidance of Divisional Commander Claude Meier, Army Chief of Staff, describes in its 200-page report the magnitude and complexity of the task of protecting Swiss airspace and the role of ground-supported air defence (Bodluf) in this connection. They also recalled, however, that as from 2020 not only the Air Force and air defence will require new materiel, but also the ground forces. The supervisory group under the guidance of former parliamentarian Hans Altherr set forth in their presentation 16 recommendations for the evaluation and procurement of a new combat aircraft. This preparatory work is intended to put the Minister of Defence, Federal Counsellor Guy Parmelin, in a position to determine the stance of the VBS and to submit the appropriate applications to the Federal Council. A start on the evaluation needs to be made soon. The aim is to select the type by 2020, and to apply to Parliament for the commitment credit in the 2022 Army budget.

### Findings

Not surprisingly, the experts found in their report that the airspace is of strategic significance to the security of the country. In future, it will continue to be defended by combat aircraft and ground-based air defence resources. All states have to provide for security in the airspace over their territory for themselves. Cooperation with our neighbours is already being regularly rehearsed as far as is reasonably possible, but a far-reaching cooperation arrangement is hardly feasible for reasons of neutrality and independence.

### Tasks of the Air Force

In the concept for the long-term security of airspace of 27 August 2014, as the Federal Council formulated it in the reply to the question submitted by Parliamentarian Galladé, a performance level of 55 combat jets has been defined to relieve the F/A-18 fleet, according to the political and policy framework for the future configuration of the Air Force. The Air Force should be in a position to carry out independently the role of policing the airspace, "to safeguard air sovereignty in times of increased tension over periods of months, and, ultimately, in terms of air defence, at least to maintain an advantageous situation in the air, and thereby ensure the freedom of action of the ground forces".

### Four Options

The expert group set out four options as to how the performance level described could be put into effect with different areas of focus: The requirement is either about 55 to 70, or 40, 30 or 20 new combat jets. The idea with 20 units is that the existing F/A-18 fleet is retained in service until replacement in the 2030 decade. It is more than questionable, however, whether the three last figures given will be sufficient to attain the performance level cited by the Federal Council in 2014. It is evident that the variant of 55 to 70 units best fulfils the concepts put forward by the Federal Council. All the other options have more or less substantial disadvantages. Sustainability is dependent on the size of the fleet. Based on the assumption that there will be four combat aircraft permanently in the air, this means that with 40 units sustainability will last about 30 days, then the curtain comes down. With 30 units, 24-hour protection of our airspace ends after two weeks. Depending on the variant, the costs fluctuate between CHF18Bn to CHF5Bn for new combat aircraft and ground-based air defence.

### Recommendations

As has been mentioned, the internal experts were supported by an external guidance group, in which the political parties represented in the Federal Council each participated with one member, as well as members of the VBS and other Departments, as well as from industry and the Swiss Officer Corps. Their task was, taking account of all the aspects, to address questions and problems of the evaluation and procurement of a new combat aircraft in an early phase. In a seven-page report the guidance group formulated 16 recommendations. The issues were the role of combat aircraft, what performance capacities they are required to have, whether there are alternatives to combat aircraft, how sensible a one-fleet policy really is, questions of independence and neutrality, are compensation transactions a good idea, how should ground-based air defence be modernised, and should aircraft from Russia and China come into consideration.

# Paradigm Shift at Infantry Company Level

## New Thinking on the Most Effective Weapons Mix

**David Saw**

**There was a time when the conventional wisdom was that the smallest unit capable of independent operations was a brigade; then fashion and thinking changed, looking for more flexibility, and that led to development of the battlegroup.**

**T**he problem was that there was no right or wrong size for a battlegroup. It was often dependent on doctrine, but it could just as well be a stop-gap solution using whatever units were to hand to deal with an emergency. Then came the idea to build a battlegroup on an existing battalion and simply add attachments, and now further tactical and organisational evolution has seen company-sized formations increasingly given serious, independent operational tasks.

Obviously there are limitations to what can be expected of a company-sized unit, and when giving a company an independent operational task, specific attachments will be required. The French Army extensively uses the sous-groupement tactique interarmes (SGTIA) or Combined Arms Tactical Subgroup, which is a company-sized formation strengthened with attachments, commanded by a captain, with a strength of some 200 troops. The SGTIA is an established part of French military doctrine and is deployed as a pre-existing unit, but it is also possible for an SGTIA to be formed as an expedient solution from whatever units are available, as required. During Operation Serval in Mali (December 2012 to July 2014), the French Army used SGTIA that were both pre-existing and organised in-theatre.

The SGTIA normally comprises a mixed command and logistic platoon, three infantry platoons, a platoon of armour, and a combat engineer platoon, with supporting attachments including artillery, and an organisation responsible for fire support coordination, under the command of the SGTIA second-in-command, usually a captain. This could include a Joint Terminal Attack Controller (JTAC) and a liaison, observation and coordination detachment. Additionally, an intelligence cell might be added

Photo: MOD UK



***In the midst of a firefight in Helmand Province, Afghanistan, on 23 June 2010, a British soldier with an L7 General Purpose Machine Gun (GPMG). Once a squad-level weapon, the GPMG is now, more often than not, a battalion-level asset in the support company. The current L7A2 GPMG of the British Army was built by Heckler & Koch.***

to the mix. It is noteworthy that the combat engineer platoon is equipped with the ECA Group IT180 UAV, giving the SGTIA an organic reconnaissance capability.

Even more will be expected from French Army SGTIA once their battlefield digitisation effort comes to fruition. At the initial level this will be the future soldier system FELIN (Fantassin à Équipements et Liaisons Intégrés). The complete French Army digital architecture, the SCORPION integrated network and information management system, is due to be online in 2025. This investment in digitisation will be a key enabler for SGTIA-sized units to conduct rapid manoeuvre warfare while dispersed over

great distances and will give them access to fire support and logistic support as they need it.

The French Army SGTIA concept is probably the ultimate evolution of the company structure, although it is a relatively standard mechanised infantry company. The roots of the SGTIA lie in the long history of intervention operations by the French military in Francophone Africa, and the development of effective task-based units to meet operational requirements. The SGTIA is now being seen as having a role to play outside contingency operations and overseas operations such as the French involvement in Afghanistan, and this formation is now





Photo: US Marine Corps

**A US Marine Corps M27 Infantry Automatic Rifle (IAR) being used on the range at Camp Lejeune. The M27 IAR is based on the Heckler & Koch HK416 and was selected by the Marines to replace the M249 light machine gun at the squad level. Now there are 27 M27s in the three rifle platoons and six M249s at company-level in a rifle company.**

central to the organisational structure of the French ground forces.

As unit sizes shrink in Western armies, due to factors such as budgetary limitations and an inability to recruit and retain sufficient troops, it is likely that the “company with attachments” will become the basic independent operational unit in many militaries. Some will not need to follow this route: the US Army and the US Marine Corps do not face the troop shortages common in other western armies, and have companies with a lot more bodies and a lot more equipment. For example, a US Marine Corps (USMC) rifle company has a command element, three rifle platoons and a weapons platoon, translating into some 180 troops. The battalion to which the company belongs will often add medical personnel, forward observers/fire controllers and support weapons from the heavy weapons company in the battalion, thus significantly boosting company capabilities and troop numbers.

## Evolving Structures

While the USMC rifle company might not have the operational latitude given to a French Army SGTIA, it is capable of a lot more than a conventional infantry company at the end of the 1970s, for example. In the 1970s the company would be expected to seize the initiative and dominate: some 40 years later the same holds true, but the company can be tasked with other missions as well, to shape the situation and deter the

enemy. If that fails, then they are to prevail in combat, then stabilise the situation, and finally enable the civil authority to take over. The rifle company has a headquarters element, with a weapons platoon and three rifle platoons each comprising three rifle squads, and each squad broken down into three fire teams. Each fire team has four personnel, and until quite recently the weapons available to the fire team consisted of an M16A4 with M203 grenade launcher,

two standard M16A4 and a single M249 Squad Automatic Weapon (SAW).

The weapons platoon has a headquarters, then a machine gun section of three squads, with each squad consisting of two machine gun teams of three personnel each, the weapons being six M240G 7.62x51mm machine guns. There is a mortar section consisting of three squads, each with three M224 60mm mortars, and finally there is an assault section comprising three assault squads each of four personnel, with a total of six Mk153 SMAW systems across the section.

All things considered, this is a reasonable, not excessive amount of firepower: at the infantry platoon level, assault rifles and M249 SAW in 5.56x45mm calibre and the M203 40mm grenade launcher, with the weapons platoon having six M240 7.62x51mm machine guns, three M224 60mm mortars and six SMAW systems.

Then operational experience brought new insights, doctrine evolved and new equipment entered service in response to these insights and to support the new doctrine, and in the context of the USMC rifle company significant changes in weapons began to emerge.

The starting point for this process was the decision for marine officers to replace their 9x19mm M9 pistols with the M4 carbine. Then, those troops who were performing tasks where the full-size M16A4 rifle was too cumbersome were allowed to switch to the M4. Following that, in mid-2015, it was announced that the M4 would become



Photo: US Marine Corps

**US Marines of Marine Rotational Force Europe 17.1 (MRF-E), register an M224 60mm mortar system, in Porsangmoen, Norway, in February 2017. Each US Marine rifle company has a mortar section with three M224 mortars to provide indirect fire support, with 81mm mortars at the battalion level.**

standard issue for all marine infantry and that the M16A4 would be withdrawn and issued only to support troops where appropriate. On the surface, considering the emphasis that the Marines put on marksmanship and accurate aimed fire, the decision to adopt the M4 appears out of character. However, other steps were being taken to alter the squad-level weapons mix.

decided to retain the weapon in service: typically a Marine rifle company will have 27 M27 IARs, replacing the M249 at the fire team level, and six M249s at the company level.

Now the USMC is considering using the M27 IAR to replace the M4 at squad level. This is ironic, as the M27 is a development of the HK416, which itself is based on the

be a work in progress, and solutions are readily available, though not necessarily from within the USA.

While the M27 and the IAR concept appear to be in line with USMC doctrine, it is significant that the initial plan to remove the M249 from service was halted. Good though the M27 is, it is still a 5.56x45mm NATO calibre weapon, with all the advantages and disadvantages that this implies. It also lacks the ability to deliver the sheer volume of suppressive fire of a belt-fed weapon like the M249. The fact that the Marines have made the M249 a company-level asset is recognition of the importance of such suppressive fire. There is a danger in this, however: the fact that there are now six M249s at company level might lead to the suggestion that it would be sensible for the M249 replace the six M240Gs currently fielded. That would be foolish: useful though the M249 is, it does not have the capabilities in terms of range and suppression that the 7.62x51mm M240G has.

(Having said that, a new 11 August 2017 acquisition Notice from the USMC Systems Command states that the Corps “intends to solicit and negotiate with only one source under the authority of FAR 6.302-1, Only One Responsible Source (FAR 6302.1 (a)(2)(ii)), based on substantial duplication of costs to the Government that are not expected to be recovered through competition and unacceptable delays in fulfilling the agency’s requirements. The Government intends to solicit and negotiate with Heckler & Koch (H&K) in Virginia for up to 50,814 M27 Infantry Automatic Rifles (IAR).” It therefore seems that the USMC, at least, intends to dump the M4, having only made it standard issue in mid-2015 and replace it totally with the M27. The M27 costs US\$3,000 a weapon, so this is a big deal. – Ed.)

## Future

Overall the USMC rifle company is a very capable organisation, but there are some structural issues. For example, the standard organisation does not have any organic anti-tank capabilities – these are kept at battalion level in the weapons company and deployed as necessary. The same applies to the heavy machine gun platoon (six M2HB heavy machine guns and/or Mk19 40mm AGLs) or the mortar platoon with eight 81mm mortars. The company can acquire heavier weapons and specialist attachments from the battalion that can dramatically increase its combat power, assuming that these extra assets remain available. The trend towards the acquisition of portable, lightweight firepower, particularly in



Photo: US Army

**Range work with the M249 SAW for the Rhode Island Army National Guard in July 2017. Unlike the Marines, the US Army still has the M249 as a squad-level asset, though this might change if the move towards changing the standard rifle calibre goes ahead. This could see the demise of the M4/M16 and M249.**

The M249 SAW had been adopted by the Marines in 1985 on the back of the US Army decision to acquire the FN MINIMI as the M249, and was a logical way of getting suppressive firepower into the hands of the infantry fire team. For some, though, this suppressive firepower was not enough and the thinking that accurate, aimed fire could replace the SAW eventually led to a programme known as the Infantry Automatic Rifle (IAR). After evaluating offerings from Colt, FN and Heckler & Koch, it was decided to go forward with the IAR version of the Heckler & Koch HK416. In mid-2010 this weapon was officially designated as the M27 IAR and entered service with the Marines in December 2010.

The idea was that the M27 would replace the M249 SAW: it was half the weight and offered greater precision over similar ranges. The initial M27 requirement was for 6,500 weapons, but only 4,476 were initially contracted for. Some 4,153 were in service by early 2016. While less weight and more accuracy are helpful characteristics, the loss of volume of suppressive fire is a significant issue, and this led to a change of course regarding the M249 and it was

M4. In an ideal world the Marines would probably look to equip all of their infantry with the M27, but with the M27 costing three times more than an M4 that was widely considered to be unfeasible – until August 2017. At the fire team level there is already one M27 as the SAW replacement; two more M27s could come into the fire team in place of the M4; and the fire team leader would retain the M4. In total, this plan to add more than 11,000 new M27 IARs for the USMC would cost in the region of US\$33M.

There is certainly a lot of enthusiasm for bringing more M27s into service. The fact that the M27 weighs less, is more accurate and more reliable than the M4 are all positive points. It should also be noted that the M27, along with the M4, took part in an experiment on deployment to Norway, where the weapons were fitted with suppressors. There were some advantages noted, in particular signature reduction, but the suppressors got very hot, added extra weight and needed to be cleaned carefully. At this point, finding an effective suppressor for the M249, M240G and the M2HB heavy machine gun appears to still



Photo: Saab



**The British Army is considering the CARL-GUSTAF M4 multi-role weapon system as a replacement for its 60mm mortars. The current generation CARL-GUSTAF M4 would make an excellent company-level firepower asset, and, with a tube weight under 7 kg, its weight burden is significantly reduced.**

Afghanistan, has seen a resurgence of interest in the NAMMO M72 family of weapons. Originally a disposable Light Anti-Tank Weapon (LAW), the family has evolved further into multipurpose and Anti-Structure Munition (ASM) variants. The advantage of the M72 is that it is affordable, so it can be widely deployed, and it is lightweight, so reasonable numbers can be carried.

The British Army used the M72 in Afghanistan and then went on to acquire another system for the ASM application, the Dynamit Nobel RGW90. The RGW90 was originally developed by the Singapore Defence Science & Technology Agency (DSTA), Rafael of Israel and Dynamit Nobel to meet a Singapore Armed Forces (SAF) requirement that led to the MATADOR (man-portable anti-tank anti-door) or RGW90 family. The MATADOR entered service with the SAF in 2004 and was first used in combat by the Israel Defense Force in Gaza in January 2009.

Another weapon that is of interest to the British Army is the Saab CARL-GUSTAF M4 system, which is described as a multi-role weapon. The current M4 variant is smaller and lighter than its predecessors, weighing under 7 kg, and has an immense range of ammunition on offer, including anti-tank, ASM, HE, HEDP, illuminating and smoke. The British see the CARL-GUSTAF as a potential 60mm mortar replacement – not the most obvious application – but the CARL-GUSTAF has the capability to become an important and flexible company-level firepower asset.

Current developments in the US could lead to a revolution in company-level firepower as regards small arms. The US

Army has been conducting the Small Arms Ammunition Configuration Study for a number of years, and this has now built up a level of momentum which could see the end of the M4/M16 platform and the

tified a potential gap in the capability of ground forces and infantry to penetrate body armour using existing ammunition. To address this operational need, the Army is looking for an Interim Combat Service Rifle (ICSR) that is capable of defeating emerging threats. The government has a requirement to acquire a commercial 7.62mm ICSR to field with the M80A1 Enhanced Performance Round (EPR) to engage and defeat protected and unprotected threats. The ultimate objective of the program is to acquire and field a 7.62mm ICSR that will increase soldier lethality."

Whether the ICSR in 7.62x51mm is the eventual M4/M16 replacement or a stepping stone is open to question, as is the eventual calibre selected – 7.62mm or an intermediate round. If this goes ahead it fundamentally changes the small arms mix at the squad and platoon level, and also impacts on support weapons at Company-level and beyond. If the US Army turns its back on 5.56mm, a new assault rifle, IAR and SAW will be required. If it decides to go for an intermediate round, might that challenge the dominance of 7.62x51mm as a machine gun calibre, leading to a new medium machine gun requirement?

Photo: US Army



**The Georgia Army National Guard conducting a live fire with the 7.62x51mm M240B machine gun in June 2017. For both the US Army and the US Marine Corps, the M240, the US version of the FN MAG, is a company-level asset providing sustained fire support and suppression.**

5.56x45mm round in US Army service. The ammunition study and other US Army small arms research seemed to point to the selection of a new intermediate round in a 6.5mm to 7mm calibre. However, it seems that this intermediate round is no longer seen as the solution, following a solicitation issued by US Army Contracting Command, on 4 August 2017, for an Interim Combat Service Rifle (ICSR).

The solicitation states: "The Army has iden-

The potential end of the 5.56mm calibre opens up a host of possibilities: should the US Army subsequently decide to give up on 7.62mm, it would open the doors to a new era for small arms. If the US Army does follow a new small arms path, inevitably the rest of NATO will have to follow. As a consequence, this will change the picture as regards company-level fire support options, requiring new thinking on the most effective weapons mix. ■

# MIV: FRESH Thinking?

Tim Mahon

Britain's Mechanised Infantry Vehicle (MIV) is an attempt to bring what several observers term "transformational expeditionary warfare capability" to the Army. It has been talked about ever since the launch of the concept of Strike Brigades, for which it will be a core component. Yet nothing concrete seems to be happening and industry continues to wait on an obscure and frustrating decision-making process before committing to assertive action.

Despite valiant attempts at acquisition reform, at accelerating the decision-making process and at making procurement of military equipment less vulnerable to public criticism, some projects seem to be doomed to failure from the start. Well over a decade ago, the then much-vaunted Future Rapid Effect System (FRES) aimed at giving the British Army some 4,000 modern armoured vehicles to replace SAXON, FV432 and some of the Combat Vehicle Reconnaissance (Tracked) (CVR(T)) family of SCORPION, SCIMITAR AND SARACEN. Two variants were planned, dubbed FRES Utility Variant and Special Variant (FRES UV and FRES SV) respectively. From 1999 onwards the UK Ministry of Defence (UK-MoD) examined, considered and evaluated – sometimes at apparently glacial speed – a number of options for the vehicles. Given the potential value of contracts covering 4,000 vehicles, that was completely understandable.

## Criticisms of Missteps, Accusations of Mistakes

Errors, overspend and wastage had made the MoD cautious about making rapid decisions. This, unfortunately, seems to have become something of a vicious circle – perhaps even a self-fulfilling prophecy – that is circling in the minds of many observers today, as the process for procuring the next 'big ticket item' for the Army begins to unfold – to similar cries of frustration and accusations of error.

Despite the fact that the FRES SV programme is going ahead as the AJAX programme – albeit in reduced numbers and after several requirements changes that have delayed and disrupted progress – FRES as a whole was a failure. The FRES UV requirement was too broad, too all-

Photo: Justin Howe, U.S. Army



**Polish version of Patria AMV known as KTO ROSOMAK type M1M in Afghanistan.**

embracing as regards the breadth of mission requirements expected of a single platform, too complex and eventually deemed unaffordable and unworkable. FRES UV was therefore summarily cancelled in 2008, as a result of the two sides "failing to reach agreement regarding contractual issues," according to reports at the time. This left a number of unsatisfied major companies scratching their heads. Thales and Boeing, who had been appointed as the System of Systems Integrator to oversee and resolve the complexity of the programme (shades of Future Combat Systems, anyone?) saw their role scrapped. ARTEC, whose BOXER vehicle had seemed to be an ideal candidate, found themselves rejected after early enthusiasm – and must be suffering from a degree of déjà vu. General Dynamics, who received the accolade of being nominated as preferred supplier, with the Piranha V, waited with bated breath for contract signature and the appearance of orders for production batches: in vain.

In another sense, of course, supporters of the FRES concept will (and do) point to the current evolution as a mark of success for the programme. After all, is not MIV

simply FRES UV by another name? Does the cancellation of FRES UV and the emergence of MIV as the 'key enabler' for the Army 2020 vision and beyond not prove the MoD's moral courage in taking what Sir Humphrey Appleby might have termed "a brave decision, Minister?" Perhaps so; these are not entirely specious arguments. But in order to support that view – and, to a degree, to rehabilitate the Ministry in the eyes of its many critics – the MIV programme needs reinvigorating and above all needs to be lifted out of the morass of "business as usual." The government (for it would be invidious to point the finger of responsibility solely at the MoD) has an opportunity to use MIV as proof of its seriousness, its pragmatism and its ability to conduct procurement in a sensible, responsible manner that addresses national as well as military needs.

MIV is a different vehicle – to call it 'son of FRES UV' would be misleading. However, it is evolutionary rather than revolutionary, at least, that is what the observing community believes. But it is difficult to tell, for almost exactly two years after the then Chief of the General Staff General Sir Nick Carter

## Author

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Photo: Artec GmbH

**The BOXER 8x8 from Artec GmbH (a joint venture between KMW and Rheinmetall) is a high-quality contender from Germany.**

launched the concept at the DSEI show in London in September 2015, there is still very little concrete information available. Almost the only issues that are 'known' are that MIV will be a wheeled vehicle (little surprise there) and will be in a 'medium-heavy'

8x8 configuration. ESD understands from several sources close to the programme that a position paper was circulated to industry earlier this year – though it is a very long way from being even an outline requirement at this stage, apparently. One

of the few issues that have been confirmed at this point is the putative quantity to be procured. At 307 vehicles, the number is a strong argument for accepting as much 'off the shelf' content as possible in order to reduce any development costs to meet specific capability requirements, which, being amortised across so small a fleet, would boost unit price considerably.

The capabilities MIV will bring to the Army, it is understood, revolve around the concept of the two Strike Brigades which were revealed as part of the Army's evolving plan in the Strategic Defence & Security Review (SDSR) 2015. Rather than "ripping up Army 2020," as some critics fulminated on SDSR's publication, the Army prefers to see the Strike Brigades and the changes associated with them as an evolution of the original vision, taking a longer timeframe and ongoing environmental changes into account. The period between SDSR 2010 and its 2015 successor saw transformational change in concepts of operations, occasioned by the evolving threat envelope and the necessity of a cohesive security policy to cater for them all – all the time.

One of the fundamental changes has been recognition of what the MoD terms "the pervasive nature of information in modern warfare." That in turn has led to recogni-

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**VBCI (Véhicule Blindé de Combat de l'Infanterie) is a highly-regarded contender for MIV from France.**

Photo: STK



**The STK TERREX could be viable contender for MIV.**

Photo: GDELS



**The Mowag-GDELS PIRANHA 8x8: earlier iterations of the PIRANHA V had already completed the UK's FRES "Trials of Truth" back in 2007.**

tion of the evolving character of conflict: it is not overstating the case to say that militaries such as the British live in a permanent state of competition or conflict – there is no longer a clear-cut division between 'peacetime' and 'wartime'. Leaving aside the academic arguments as to the definition of war, there is a huge degree of truth in that assertion – which has already led to changes in structure, doctrine and the operational art. AJAX, for example, is increasingly referred to officially as a "C4ISR vehicle," rather than purely a reconnaissance platform. Its six variants will be "task organised to operate in tandem with a compatible armoured personnel carrier," according to official sources. Enter MIV, stage left.

### Acquisition without a Plan

In the absence of a formal requirement having been issued (and if the MoD is seeking industrial input prior to issuing such a requirement, that is a laudable initiative) there are some things that can be assumed with a degree of confidence. One issue is that, if the vehicle is to bring "transformational expeditionary warfare capability" to the Strike Brigades, the selected vehicle will need to be airportable – preferably in a C-130 or A400M, since recent history in heavy utilisation of the C-17 fleet makes its availability for platform transport somewhat questionable. That imposes a weight restriction, which may militate against one or more of the potential contenders.

Another requirement will be armament. "A 12.7mm or .50 calibre machine gun is not going to cut it as a solution," an industrial observer of the programme told ESD. "Whether you're facing modern Russian AIFVs in a traditional context or seeking to overwhelm lighter forces in an expeditionary scenario, an automatic cannon of 30 or 35mm calibre – even 40mm, perhaps, will be a definite requirement." One solution that springs to mind immediately is the CTAI 40mm cannon that equips AJAX. Commonality of capability, a simplified logistics footprint, reduced training burden and reduced lifecycle costs are all positive attributes of such a solution, but it is not without its detractors. According to discussions in public fora on the Internet, the CTAI 40mm has a barrel life of little more than 1,000 rounds which, coupled with the reputedly very high ammunition costs, offer a challenging cost-benefits analysis equation for the user.

Other aspects of MIV also reinforce the general feeling of uncertainty in industry. "Nothing has been said about an expected in-service date as yet – but the fear is that



it will be a very challenging timeline," the industrial observer stated. If that date turns out to be 2021-2022 – as is expected by fully half the contacts spoken to during the research for this article – then the issuing of a definitive requirement and negotiation of a contract, not to mention the procurement of long lead time items and the trivial issue of actual production mean that this could from the very beginning be a programme that will miss deadlines: big time. This would destroy much of the good work MoD is trying to do in facing its challenges and critics.

The Army stands at the forefront of that work. To be frank, this is not before time, but it is all the more welcome for all that. Recognition of the flaws in the decision-making and procurement processes and above all an understanding that delays in any stage of the process can have catastrophic effect on the desired end state have taken hold within the service in recent years. The Chief of the General Staff himself, according to official statements last year, recognises that the degree of modernisation the Army seeks "carries with it the challenge of running [the process] better and delivering better capability" – good news for industry as well as the wider defence and security community.

The thorny problem that nobody has yet addressed to anybody's satisfaction, however, is an unsurprisingly and frustratingly familiar one. Where will the money come from? According to the MoD in late 2016 – before the circulation of the paper referred to earlier – "money for MIV has been earmarked." Which is interesting; the lack of a firm requirement and the lack of any bids so far make the pricing game pure guesswork. Obviously, generic platform and support costs can be assumed and used in order to estimate the budget that needs to be set aside, but experience shows that such sums fall all too easily prey to the predations of ministers and programme managers for projects already under way. "MIV is one



Photos: FNSS and Yugoimport


***The PARS ("Leopard") from FNSS is a good example of an alternative potential supplier for when the UK MoD runs out of money again...***



***...And other designs, such as the Yugoimport LAZAR need political resolution to be genuinely considered, but are fully-capable in their own right***

of the Army's top priorities," the MoD is on record as saying: but so too is the Challenger 2 upgrade, the acquisition of a vehicle for the Royal Marines and the increasingly controversial Warrior Capability Sustainment Programme – for which last ESD

understands that Defence Equipment & Supply (DE&S) has recently commissioned an external third-party examination of alternatives to the current programme, so frustrated is it by the continuing delays and obstacles being encountered. Cash for all



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Photo: Kaminski



**The VBM FRECCIA is one of two top-level 8x8 vehicles from Italy that are rarely mentioned in connection with MIV – why?**

Photo: Bozen



**The Iveco SuperAV is chasing success (teamed with BAE Systems) with the USMC, but is another “silent MIV contender” – at least in theory.**

these has also been ‘earmarked.’ But what happens when any of these programmes requires a further financial transfusion? Where does that money come from?

## Make in UK?

It is difficult not to have a degree of sympathy for the MoD, which must sometimes feel it will be pilloried and lambasted whatever decision it takes – or, indeed, if it takes none. Regrettably, that is a reality of modern defence systems procurement, which is more subject to the capricious whims of politics and politicians than almost any other sector of government expenditure – which leads to another consideration worth reflecting on, and one that takes on a different complexion as the UK moves

inexorably towards leaving the European Union: where will the selected vehicles be built?

The United Kingdom does not have much recent experience of series production for medium-heavy armoured vehicles, except in collaboration with foreign enterprises. That seems destined to continue. The problem becomes a starkly arithmetical: a total of 307 vehicles – even though that may be a £1Bn+ order, and even if they are all ordered simultaneously under a single contract, is just about on the edge of viability for the creation of a bespoke production facility, no matter what contractual constraints or incentives may be included. But compromises could be made – and at least two vocal observers believe should be made – in legislating for assembly and

some manufacturing to be carried out at Armstrong Works in Newcastle, now operated by Pearson Engineering. “Made in America,” “Made in Israel” and “Make in India” are all phrases increasingly heard around the bazaars. Why should “Make/ Made in Britain” not become equally familiar?

The situation for MIV is far from clear, but it would be a mistake to paint an entirely bleak picture. It is one of the more important addressable AFV procurement programmes; it is a critically important issue for the British Army; it represents an opportunity for the UK government to demonstrate its resolve and capability in accelerating and sensibly managing a programme that will transform military capability; and it offers industry an opportunity to shine.

Among the contenders likely to be put forward for MIV are ARTEC’s BOXER, which was rumoured to be the MOD’s preferred choice (though such rumours have been unequivocally denied) and which some see as too heavy and too expensive for the likely requirement, no matter how clever and flexible the modular configuration. PIRANHA V, which ESD understands General Dynamics refused to allow to be submitted, is back in the starting gate as a result of apparent changes of heart. It will, if current rumours prove to be true, be joined by a new, innovative and as yet unnamed design from the same stable. Nexter’s VBCI, which the Army evaluated briefly in a 2014-2015 trial, is also on offer, with the manufacturer having invested significantly in enhancing the areas in which it fell short during the FRES UV evaluations. Patria will offer at least one and possibly two variants of the AMV and is being supported as a strong contender by many observers as flexible and capable. Finnish industry is not well known in Britain and there are some who feel this will be a major barrier to having AMV objectively evaluated; but the tradition of local manufacture is well-established for AMV. The dark horse could be the Singapore Technologies Kinetics TERREX vehicle, though whether that will be TERREX 2 or TERREX 3, which is the company’s offering for the Australian Land 400 project, is as yet unknown.

3-10a Photo 9

Which neatly summarises the programme: the fact that so many factors have had to be considered in this article prior to identifying the contenders demonstrates just how complex and uncertain it is at the moment. But it does not need to continue to be so – indeed, it should not continue to be so. The British government has real opportunity here. It is devoutly to be hoped it has the will, the skill and the wherewithal to address it successfully. ■



# Move Forward More Slowly

## The British CHALLENGER 2 Upgrade Programme

David Saw

**The current era is one of grave uncertainty for the British Army: unsure of how much money will be available, concerned over their inability to recruit enough troops, and still searching for a convincing recipe that can define their role post-Iraq and post-Afghanistan.**

There appears to be a crisis of confidence brewing, and matters are not helped when senior American officers regularly comment on how small the British Army has become and how dangerous that is. These are difficult times indeed for the Army, searching for a role in a world of political strategic fantasy where dreams and reality are an entire budget apart. The search has led to a tsunami

in five days. A VBCI-equivalent capability is to be acquired by the British Army under the Mechanised Infantry Vehicle (MIV) programme for an 8x8 vehicle. As tremendously useful as this future "Strike Brigade" capability might be, it is somewhat limited in an operational environment where the threat is high-order conventional: just the sort of threat that could be encountered during the increas-

fence (UKMOD) is moving forward with the CHALLENGER 2 Life Extension Project (LEP) that will eventually see a contractor selected to upgrade the tank fleet and keep it in service through to 2035.

### Beginnings

The FV4030/4 CHALLENGER 1 entered service with the British Army in April 1983 and production continued to 1990 with 420 tanks acquired. This MBT was not without its problems, but in the 1990/1991 Gulf War, in which the British participation was known as Operation Granby, British forces used some 221 CHALLENGER 1 MBTs, which knocked out 300 Iraqi tanks without loss, including a long range tank kill with an APFSDS munition at a range of 4,700 metres (the range is often given as 5,100 metres, but it appears that this was the range at which the target was lazed, not engaged). Despite having proven the critics wrong, by 1996 the CHALLENGER 1 MBT began to be withdrawn from British Army service. In June 1999, Britain agreed to supply Jordan with 288 surplus CHALLENGER 1 MBTs, following that up with a second agreement in February 2003 to sell a further 104.

The reason for the withdrawal of the CHALLENGER 1 was the belief that it was more cost-effective to purchase a new-generation tank in the form of the FV4034 CHALLENGER 2. The story of that tank starts in October 1986, when Vickers Defence Systems acquired the Royal Ordnance Factory at Leeds (the CHALLENGER 1 manufacturing facility) as part of the government privatisation programme. Vickers also had their own tank design and build capability based on their facility at Newcastle, and this all made Vickers the only game in town as far as British MBTs were concerned. In November 1986, Vickers started working on the CHALLENGER 2 design as a private venture. Vickers held the first discussions with the



Photo: MOD UK

**A CHALLENGER 2 tank participating in Exercise "VENERABLE GAUNTLET" in September 2016, this was the UK's national validation exercise for the NATO Very High Readiness Joint Task Force (Land) 2017 (VJTF(L)17), in which 14 NATO countries took part. This is a standard configuration CHALLENGER 2 with no additional protection.**

of Powerpoint presentations, countless strategic reviews and an awful lot of talking, yet very little of real substance has emerged. There are some real changes dawning, though: there remains a lot of impetus behind deployable brigade-sized formations, and plenty of interest shown in the French deployment to Mali in 2013, where a French battalion equipped with VBCI wheeled vehicles covered 2,000 km

ing number of deployments that the British Army is making to the eastern border of NATO, to places such as Poland and the Baltic states. It is here that the British Army will need heavy mechanised forces, but the problem is that the current British CHALLENGER 2 Main Battle Tank (MBT) requires significant upgrade work to allow it to deal with present and future threats. The British Ministry of De-

Photo: MOD UK



**The CHALLENGER 2 was an extremely well protected tank: one example in Iraq took 70 RPG hits! Developments in the IED and RPG threat led to the fielding of the Theatre Entry Standard (TES) variant of the CHALLENGER 2 with enhanced armour, IED jamming systems and other electronic countermeasures.**

Photo: MOD UK



**CHALLENGER 2 loader prepared to load a Drill Sabot Trainer (DST) into the L30A1 120 mm rifled tank gun during an exercise at the Castlemartin Ranges in Pembrokeshire, Wales. Replacing the rifled gun and its two-piece ammunition would require major changes to the turret interior.**

MOD on the new MBT in March 1987 and procurement began in February 1988. From 1988 to 1990 Vickers would conduct a demonstration phase, and in 1991 the CHALLENGER 2 tank would be evaluated against the M1 ABRAMS and the LEOPARD 2, with the assumption being that the British tank would inevitably win. Interestingly, it appears that the user preference was for the LEOPARD 2 with the M1 in second place: it was a political decision to proceed with the CHALLENGER 2.

The initial order was for 127 MBTs and 13 Driver Training Tanks (DTT). Oman became the first export customer in 1993, ordering

a total of 38 tanks, and the second British order in July 1994 covered an additional 259 MBTs and nine DTTs. The first tanks for the British Army were delivered in January 1998, with the first regiment being fully equipped by June of that year. All tanks were delivered by 2002. Subsequently Britain ordered CHALLENGER 2 variants, the TITAN AVLB bridgelayer (33 units) and TROJAN AVRE Combat Engineer (33 units) vehicles. The CHALLENGER 2 made its combat debut in 2003 during Operation Telic in Iraq. It was extremely successful in combat operations, demonstrating high levels of reliability and protection. One tank took

Photo: MOD UK



multiple RPG hits as well as a Milan anti-tank missile hit; another CHALLENGER 2 reportedly took 70 RPG hits. There was vehicle damage when an RPG-29 managed to penetrate the driver's compartment of a tank injuring the driver, while another incident saw an IED also injure a tank driver. The only combat loss of a CHALLENGER 2 was blue-on-blue in 2003, where a HESH round killed two crew and eventually the stowed ammunition detonated.

Due to ongoing operations in Southern Iraq, there was significant emphasis on improving CHALLENGER 2 protection, with the ultimate development being the Theatre Entry Standard (TES), with appliqué armour on the hull and turret sides, additional armour on the hull front underside, bar armour at the rear of the hull and an IED jamming system along with other protection improvements. TES raises the vehicle weight from 62.5 tonnes to over 74 tonnes, but this upgrade is not permanent and is only added in response to operational needs.

## Upgrade Path

The CHALLENGER 2 had been combat proven, so it would be logical to build on this operational experience and upgrade the tank further to enhance its capabilities. While the British would attempt – unsuccessfully – to upgrade the CHALLENGER, there was a view that this activity was a waste of time because tanks were resource intensive and of limited utility in the context of operations which envisaged deployable medium-weight forces. Indeed, as the Brit-





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**CHALLENGER 2** fires a **High-Explosive Squash Head (HESH)** practice round at the **Castlemartin Ranges**. **HESH** rounds have always been seen as extremely useful by the British Army but were only available for rifled guns, today many **HESH** capabilities can be delivered by smoothbore guns using programmable **HE** rounds.

ish Army became more involved in asymmetric conflict there was a school of thought that believed the attack helicopter was of much more value than the tank.

The first upgrade attempt was the **CHALLENGER** Lethality Improvement Programme (CLIP). This started in January 2004, and the aim was to replace the L30A1 120 mm rifled gun with the Rheinmetall 120 mm L/55 smoothbore gun. A single tank had the new gun installed and was successfully trialed in January 2006, but installing the new gun would be a difficult and expensive process: in particular, accommodating the single-piece ammunition of the smoothbore gun would require major changes to the turret architecture.

**CHALLENGER 2** Capability Sustainment Programme (C2 CSP) was the next upgrade effort and this would incorporate a range of system enhancements, with BAE Systems being invited to bid for the programme in 2007. Both CLIP and CSP failed to progress, with lack of funding being a major obstacle. Tank upgrade activity fell dormant until 2013 with the emergence of the **CHALLENGER 2** Life Extension Project (LEP). Even then, this upgrade programme took time to gain momentum, with the LEP finally getting underway in 2015.

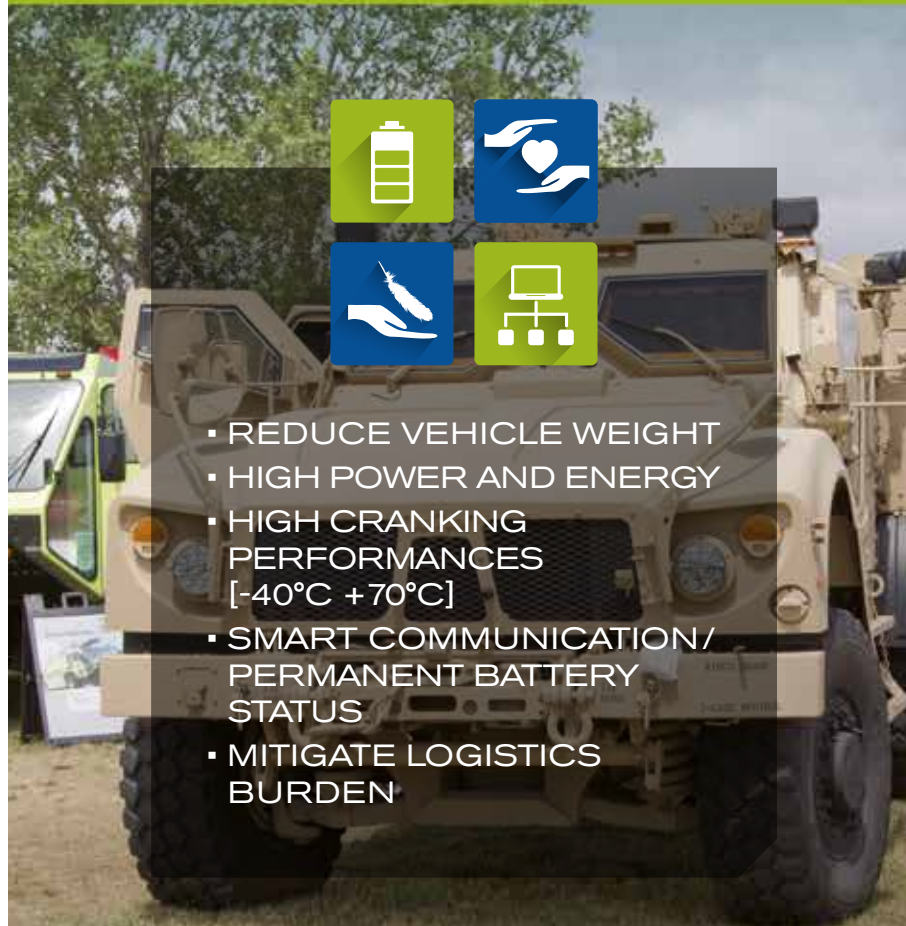
As an alternative to LEP, acquisition of a new tank was considered. The UKMOD reportedly received offers from Germany for 100 to 400 **LEOPARD 2** tanks, but while potentially attractive from a user perspective, the implications of **LEOPARD 2** acquisition were considered politically unacceptable in Britain.

This put the emphasis back on LEP. Numerous companies responded to the requirement, with bidders for the

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## Masthead

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***"Megatron" is a CHALLENGER 2 of the Armoured Trials and Development Unit (ATDU) at Bovington, shown here being tested with the Mobile Camouflage System (MCS). "Megatron" is the "reference" current configuration Theatre Entry Standard (TES) CHALLENGER 2 with enhanced armour and an improved electronic countermeasures capability.***

assessment phase: BAE Systems with General Dynamics Land Systems UK; CMI Defence with Ricardo UK; Lockheed Martin with Elbit Systems; Rheinmetall; and RUAG Defence. The LEP programme is funded up to GBP642M, inclusive of VAT and initial logistic support, and will see the out-of-service date of the CHALLENGER 2 extended to 2035. In total, 227 vehicles will be upgraded to confront obsolescence issues and provide what is described as a "precision direct fire manoeuvre capability across a broad spectrum of operations."

On 22 December 2016, the MOD announced that it had awarded contracts to BAE Systems and Rheinmetall Land Systeme GmbH to advance the CHALLENGER 2 LEP. These contracts, valued at GBP23M each, mark the start of the competitive assessment phase. According to the MOD, these contracts will allow the two teams to "undertake technical studies, produce detailed digital models and consider how upgrades will be integrated onto the current platform." The MOD believes that: "recent developments in electronics, computing and sight optics mean upgrades to several of the tank's components are now possible." The MOD also has an additional GBP7M in funding allocated to cover additional work in the assessment phase. After the completion of the assessment phase the winning bidder will be selected for CHALLENGER 2 LEP.

Since the last CHALLENGER 2 was delivered in 2002, the armoured vehicle industrial landscape in Britain has totally changed. That year saw Alvis acquire Vickers Defence Systems, having acquired the armoured vehicle business of GKN in 1998. In 2004, BAE Systems acquired Alvis, thus becoming the dominant land systems company in Britain. That year also saw the final closure of the Royal Ordnance Leeds tank factory. BAE Systems would eventually go on to close the Newcastle tank factory in 2012.





Photo: MOD UK

industrial partners in this assessment programme include Textron and Frazer-Nash. The programme objective is to determine the capabilities of the APS against a range of threats, it will also include what the MOD describes as "a BAE Systems appliqué integration of a MUSS system onto a CHALLENGER 2 to demonstrate potential future capability." It is anticipated that a fielding decision on what is designated as the CHALLENGER 2 Soft Kill Defensive Aid System will be made in April 2018. The successful introduction of an APS solution would also see the system fitted to other armoured vehicles such as AJAX, WARRIOR and the future MIV.

### The Future

With CHALLENGER 2 LEP having reached the assessment phase and moving towards the selection of a prime contractor, it might appear that everything is progressing satisfactorily. As previously noted, a total of 386 CHALLENGER 2 tanks were acquired and all were delivered by 2002, but since that time there have been combat losses and damage, and tanks have been broken up for spares and even scrapped. Most sources suggest that there are now 227 active tanks, hence the assumption that 227 vehicles will go through the LEP upgrade. But the British Army currently only has three tank regiments, all organised on a Type 56 structure, each with 56 tanks, although these will not all be on hand. Current planning calls for the number of tank regiments to be cut to two, with the third to convert to the AJAX reconnaissance vehicle in 2019 to deal with an undisclosed "different threat."

So the British Army will field two armoured regiments with a paper strength of 112 MBTs, some 30 tanks for training at BATUS in Canada, additional tanks for the Armoured Trials and Development Unit (ATDU) at Bovington and a few for other applications. It is therefore difficult to believe 227 tanks will go through LEP; indeed it is commonplace to see numbers of 170 or fewer discussed. This is disappointing, but might have an unlikely positive side effect if the budget can be preserved, as smaller numbers could possibly translate into a more comprehensive upgrade.

In the end, after years of politically-driven cutbacks, built upon dubious notions of national strategy and the consequent almost terminal neglect of the UK's conventional warfighting capability, the only certainty in all of this is that CHALLENGER 2 still desperately needs an upgrade. ■

The only true, active armoured vehicle production facility in Britain belongs to General Dynamics Land Systems UK, at Merthyr Tydfil in South Wales, which is an Armoured Fighting Vehicle Assembly, Integration and Testing (AIT) facility to support the AJAX armoured vehicle programme. General Dynamics won a GBP3.5Bn contract in September 2014 to deliver 589 AJAX armoured vehicles to the British Army, and it is anticipated that the Merthyr Tydfil site would be used for the upgrade programme.

Ironically, the Newcastle factory where the last CHALLENGER 2 MBTs were built has returned to the tank business. The facility was acquired by the Reece Group, whose defence subsidiary Pearson Engineering is now located there, and reopened in September 2015. Adding to the irony, one of the first tasks for the facility was to conduct structural assessments of some 60 CHALLENGER 2 tanks, which provide the necessary basis for any future upgrade or remedial work.

In an important related development in early July 2016, the Defence Science and Technology Laboratory (Dstl) placed a GBP7.6M contract with QinetiQ to evaluate an Active Protection System (APS) for armoured vehicles. This is part of the ME-DUSA Technical Assessment Programme (TAP) covering Dstl research into APS technology, in tandem with a complementary effort to develop the open architecture to support a future modular APS capability. QinetiQ will be using the Hensoldt MUSS (Multifunctional Self-Protection System), which is a soft-kill APS system as used on the German Army PUMA IFV. Other

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# Type 26 Global Combat Ship: Status Report

**Conrad Waters**

July 2017 saw two major, positive developments for the British Type 26 Global Combat Ship programme. The announcement of a £3.7Bn contract with BAE Systems for construction of the first three ships of the type early in the month was followed by the start of fabrication of the lead vessel – HMS GLASGOW – on 20 July. The ships will be known as the CITY Class in Royal Navy (RN) service. The project is of vital importance to the RN's future anti-submarine capabilities and the long-term health of British shipbuilding.

## Project Background

The Type 26 programme has a long, complex history. Its origins can be traced to initial concept work on replacements for the Type 22 and Type 23 frigates during the mid-1990s. Following the 1998 Strategic Defence Review, the replacement escort became known as the Future Surface Combatant. Various force mixes and designs were subsequently considered against the backdrop of a major restructuring of British shipbuilding. By 2007 planning was focused on a three tier force structure comprising:

- **C1:** An anti-submarine focused, high-end surface combatant;
- **C2:** A general purpose, less capable surface combatant for stabilisation and escort missions;
- **C3:** A flexible oceanic patrol vessel capable of performing a range of secondary roles.

In March 2010, BAE Systems was awarded a four-year assessment phase contract to develop the C1 element of this force. The Type 26 Global Combat Ship terminology was adopted at this time, reflecting a desire to highlight the new class's flexibility.

The subsequent 2010 Strategic Defence & Security Review (SDSR) confirmed the Type 26 programme. However, a reduction in the RN's size was reflected in changes to the project's extent and scope. Most significantly, it was decided

Image: BAE Systems



**A computer generated image of the Type 26 Global Combat Ship design ordered for Britain's Royal Navy. A GB£3.7Bn contract for the first three vessels of the class was announced on 2 July 2017.**

Photo: Babcock International



**The Global Combat Ship programme has its origins in the need to replace Britain's Type 22 and Type 23 frigates. The Type 23s are benefiting from a rolling programme of upgrades before the new ships arrive – the newly modernised ARGYLL is shown here.**

## Author

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to use the Type 26 design to meet both the C1 and C2 requirements. A total of 13 ships were planned to replace the remaining 13 Type 23s. Eight of these were to be fully equipped for anti-submarine warfare, with the rest equipped for a general purpose role. It was also hoped to reduce overall size and sophistication to reduce purchase costs. However, the requirements of a high-end design optimised for anti-submarine warfare conflicted with this objective. By the time the basic design was approved in mid-2012 it had reverted to a size similar to that envisaged for the original C1 ship.

The project's subsequent history has been heavily influenced by the tensions inherent in balancing the cost of the large, capable ship that emerged from the design process with a constrained defence budget. Although detailed design and development work progressed under a new demonstration phase contract awarded in early 2015 – and long-lead items for the first three ships were authorised – reaching agreement to start actual construction was slow. The impact of cost pressures was revealed in the SDSR 2015 review, which reduced planned orders to eight ships. A new class of lighter, flexible and exportable general purpose frigates – subsequently referred to as the Type 31 – will be acquired to complement the Type 26s.

## Recent Developments

In spite of the various delays, it has been apparent that impetus behind the project has been accelerating in recent months. November 2016 saw the release of a statement of intent to commence fabrication in the summer of 2017. This was accompanied by increasing activ-

ity to finalise contracts across the wider supply chain. £1.9Bn had already been committed to the programme at that time. The time taken to agree construction also allowed project management to achieve a high level of design maturity across the ship. Detailed design has been split across twelve separate design zones, with work now approaching completion on those scheduled to enter production in the early stages of construction.

An announcement that the Ministry of Defence (MoD) had signed a manufacturing contract with BAE Systems was finally made on 2 July 2017. The £3.7Bn deal includes considerable sums already allocated to long-lead items and project infrastructure. The contract was quickly followed by the formal start of construction. A first steel cutting ceremony performed by British Defence Minister Sir Michael Fallon was held on 20 July. It was revealed at the ceremony that the class would be known as the Type 26 CITY Class frigate in RN service and named after British centres of commerce and industry. [1] The first ship will take the name GLASGOW, honouring the city in which she is being built.

## Build Programme

Speaking to ESD at the end of July 2017, BAE Systems' Type 26 Programme Director Geoff Searle confirmed that assembly plans for the current three-ship order envisage an approximate two-year interval between the start of work on each ship. Assembly of the follow-on, five-ship batch – to be ordered in the early 2020s – is expected to be carried out in accordance with a faster, 18 month drumbeat. This suggests that the class will still be under construction in the early 2030s. An important aim is to ensure con-

Image: BAE Systems



**The Type 26 is a steel mono-hull displacing around 6,900 tonnes with a focus on acoustic stealth for effective anti-submarine operations. This bow view shows the locations of the forward 127mm gun, the 24-cell Mk 41 VLS and the 4 forward groups of 6-cell CAMM launch cells for the SEA CEPTOR anti-air missile system in the British CITY class version.**

tinuous production throughout the overall programme to avoid the inefficiencies that would arise from a break in assembly. Following rejection of proposals for a dedicated £200 million 'frigate factory' at BAE Systems' Scotstoun facility, production of the CITY class will take place at both the Govan and Scotstoun sites on the River Clyde in Glasgow. Assembly and outfitting will follow a process initiated with the later members of the Type 45 DARING Class destroyer and subsequently refined with the Batch 2 RIVER or FORTH Class offshore patrol vessels that are currently under construction. [2] Under this process, Govan will undertake initial fabrication and assembly up to the load-out stage. Work will then transfer to the Scotstoun yard as the focal point for completion, systems commissioning and final acceptance.

Appropriate levels of investment will be made in both sites to support CITY Class construction. Much of this will be devoted to improving the dry docks at Scotstoun to optimise them for the Type 26's hull form and to enhance other testing and commissioning facilities. Additional

Graphic: BAE Systems



**BAE Systems was awarded an initial four year assessment phase contract to develop the Type 26 design in March 2010. This graphic was released around that time and makes an interesting comparison with how the design has developed subsequently.**



Image: BAE Systems

**The aft end of the Type 26 design is dominated by a large flight deck capable of handling CHINOOK-sized helicopters. The hangar is linked to a flexible mission bay immediately forward.**



Image: BAE Systems

**A visualisation of the Type 26 operations room released in 2015. The combat management system runs on a common computing architecture that enhances efficiency and eases upgrades.**

sums will be spent adapting the Govan yard from the traditional process of completing final assembly on a slipway followed by dynamic launch to integrating constituent blocks on a flat hardstanding prior to transfer to a semi-submersible barge for float-out. The improved level

of control inherent in this method places less stress on a ship's hull and allows a higher level of completion to be achieved before she enters the water.

Construction of each CITY Class frigate will involve the fabrication of approximately eighty separate units. It is anticipated that around five of these units will be in build by the end of 2017, with production ramping up during 2018 and 2019. The completed units will subsequently be assembled to form two hull sections and a forward superstructure block in the adjacent ship block and outfit hall. These constituent sections will then be mated together on the hardstand prior to the ship's loading onto the barge for float-out and subsequent transfer to Scotstoun for completion and testing. Although a detailed schedule for GLASGOW's construction has not been published, the similarly-sized DARING took around six years from the start of fabrication to commissioning. This is broadly in line with MoD statements that GLASGOW will enter service in the 'mid-2020s'.

Images: BAE System



**Two illustrations of the Type 26's flexible mission bay. It has the potential to accommodate a wide range of equipment.**

## Ship Design

The Type 26 GCS uses a conventional steel mono-hull. Full load displacement is 6,900 tonnes, overall length of 149.9m and beam 20.8m. It is intended to be a multi-mission warship capable of operating in high intensity warfare scenarios and, accordingly, incorporates high levels of resistance to shock and other damage. It has sufficient flexibility to incorporate a wide range of equipment fits dependent on user requirements. However, the RN's primary intended use for its CITY Class frigates remains focused on high-



end, anti-submarine warfare to protect the strategic submarine force and support carrier task groups. This has inevitably had a significant impact on the overall Type 26 GCS design.

Notably, this emphasis on anti-submarine warfare has meant that minimising the ship's acoustic signature has been a primary design consideration. It has exerted an influence across major elements of the vessel, including a 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 auxiliary systems. Although experience gained from the current Type 23 DUKE Class anti-submarine frigates has informed choices, the ship adopts an entirely new hull-form.

Other important design drivers have been more heavily influenced by the multi-role specification. These include the incorporation of a flexible mission bay immediately forward of the hangar and provision of an extended helicopter deck able to handle rotorcraft up to CHINOOK size. Possibly reflecting the mixed success achieved with the innovative Type 45 destroyers, there has been considerable emphasis on selecting mature technology for the new ships.

**Propulsion:** The choice of CODLOG propulsion reflects a mission profile that could require a ship to sprint to the general location of a potential underwater contact before undertaking a lower speed search in silent mode. The diesel-electric element of the system encompasses four MTU 20V 4000 M53B generators that are also used, e.g., in the German F125 Class. These provide electricity both for ship systems and the two GE induction motors that propel the ship at lower speeds. High speed capabilities are provided by a single Rolls-Royce MT-30 gas turbine similar to those installed in the QUEEN ELIZABETH class aircraft carriers and adopted by several overseas navies. It provides a maximum speed in excess of 26 knots. Range exceeds 7,000 nautical miles. There has been some criticism that the CITY Class has not used a more sophisticated combined diesel-electric and gas (CODLAG) arrangement. This allows a ship to exploit all its installed power output to maximise top speed. However, the less complex CODLOG system specified comfortably meets the performance requirements set for the class. The propulsion and other key ship operating systems will be controlled by an integrated platform management system supplied by the UK arm of L3 MAPPs, perhaps the world leader in naval control technology.

**Network Infrastructure:** The CITY Class's combat, communications and ship management systems are hosted on a common computing infrastructure utilising commercial, open architecture technology to ease subsequent upgrades. This shared infrastructure replaces the separate hardware and associated networks used to support specific functions found in previous RN ships. It also provides an ability to control a wide range of functions from common workstations. Processing power is provided by compact blade servers that provide reliable and powerful computing capabilities. Broadly similar shared architecture has already been successfully retrofitted to a number of existing RN warships. The combat management system supported by the shared network is a variant of the BAE Systems CMS-1 already in wide RN use.

**Equipment:** The emphasis on an evolutionary, low-risk approach to the GCS design extends to the equipment specified for the CITY Class. In particular, much technology used in the capability upgrades currently being performed on the Type 23 Class has been adopted. For example, the sonar suite will be focused on the capable Thales Sonar 2087 (CAPTAS-4) variable depth system already fitted to eight of the Type 23s. The CITY Class is also likely to incorporate the upgraded bow-mounted Sonar 2050TR being installed in these eight ships.

# Type 26 in sight. Rohde & Schwarz on board.

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Image: BAE Systems



**A MERLIN helicopter pictured operating with a Royal Navy CITY Class Type 26 variant. The Global Combat Ship design is intended to be sufficiently flexible to be of interest to other navies seeking high-end anti-submarine combatants.**

The MBDA SEA CEPTOR surface-to-air missile system and BAE Systems Type 997 ARTISAN surveillance radar used in the class also originate from Type 23 upgrades. The Common Anti-air Modular Missile (Camm) at the heart of SEA CEPTOR uses active radar homing supported by mid-course guidance updates from data obtained by ARTISAN to allow engagements at ranges out to 25km and beyond. 48 canisters for the missile are split into two groups forward and aft.

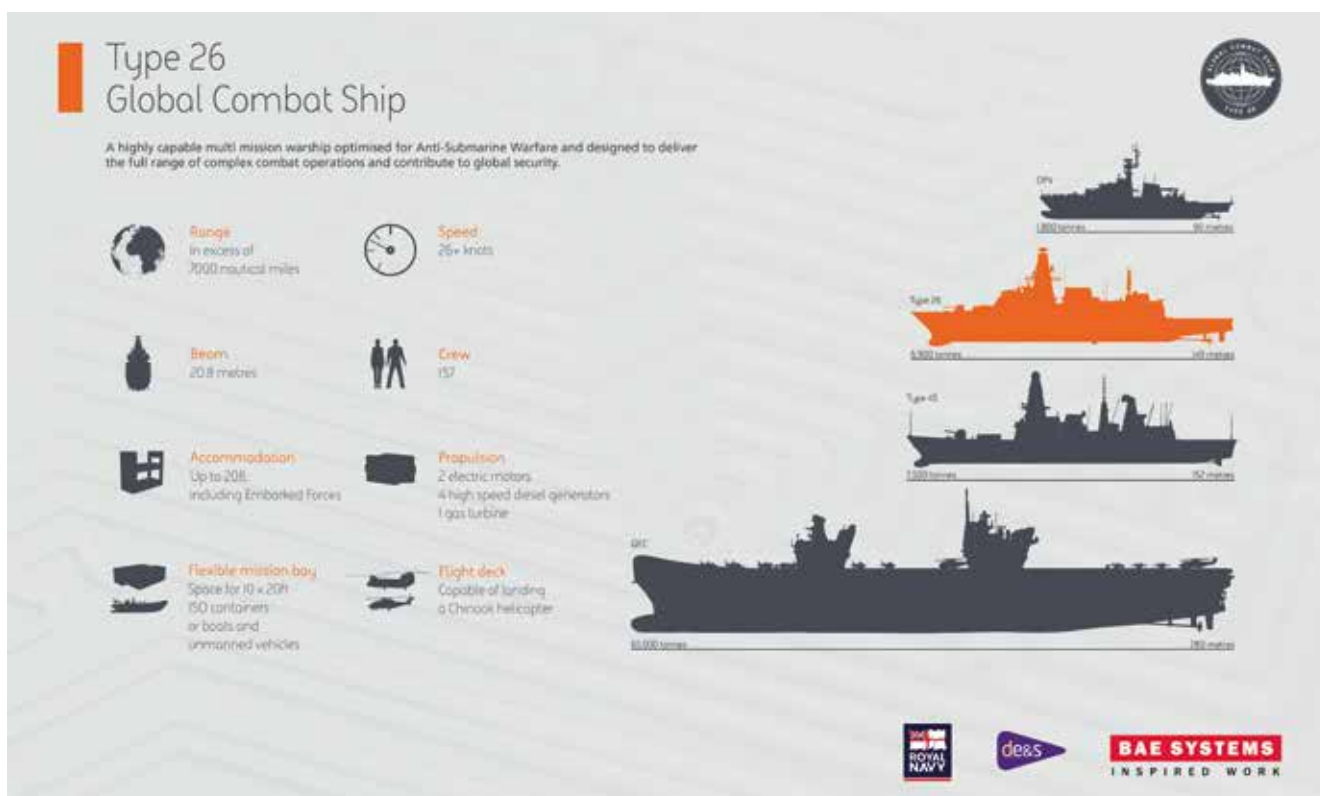
The CITY Class does see the introduction of important new equipment to RN service, notably the US Navy (USN) 127mm/62 Mk 45 Mod 4 gun. Its selection marks the abandonment of the 115mm weapon used in British escorts since the Second World War but provide greater potential for adopting smart munitions. Another USN system specified for the class is a 24-cell Mk 41 vertical launch system. This provides the option to field weapons such as TOMAHAWK

cruise missiles or ASROC rocket-launched torpedoes in due course.

**Aviation Facilities & Mission Bay:** The importance of helicopters in anti-submarine warfare operations is reflected in a hangar that can house a large, MERLIN-sized helicopter. The flight deck is large enough to support operations by all helicopters currently used by the British Armed Forces.

One innovative feature incorporated in the Type 26 design is the adaptable mission bay linked to the adjacent hangar. Similar in concept to the facility incorporated in the USN's Littoral Combat Ships, it can be used to ship a wide variety of equipment dependent on particular mission requirements. The space is large enough to house up to ten TEU containers. Alternative payloads could include various types of unmanned vehicle. The bay's location next to the helicopter hangar is particularly useful in supplementing aviation capabilities, up to and including the ability to ship a second, MERLIN helicopter.

**Accommodation:** The CITY Class has sufficient accommodation to support 208 personnel, considerably in excess of the normal crew of 157. This allows additional personnel, such as embarked military forces, to be housed for specific missions. The stated complement



Graphic: BAE Systems

**An infographic comparing the size of the Type 26 to other current generation Royal Navy surface warships. The class will be large and capable surface combatants that will refresh crucial anti-submarine warfare capabilities.**



## Statistics – Royal Navy CITY Class

<b>Ships:</b>	1 ship (GLASGOW) under construction 2 additional unnamed ships contracted 5 further unnamed ships planned
<b>Displacement (Full Load):</b>	6,900 tonnes
<b>Principal Dimensions:</b>	149.9m x 20.8m
<b>Propulsion:</b>	Combined diesel-electric or gas (CODLOG) 4 x MTU 20V 4000 M53B diesel generators, 2 x GE electric motors 1 x Rolls Royce MT-30 gas turbine 2 x shafts Maximum speed of over 26 knots, Range of over 7,000 nautical miles
<b>Armament:</b>	1 x Mk 45 Mod 4 127mm main gun 2 x PHALANX CIWS, 2 x DS30M Mk 2 30mm cannon 1 x 24-cell Mk 41 VLS 48 x CAMM vertical launch canisters Helicopter deck and hangar Flexible mission bay for a wide range of equipment
<b>Crew:</b>	157 core crew. Accommodation for 208 personnel.

is somewhat higher than the 118 figure quoted in earlier documentation. It is understood this reflects the reclassification of certain mission specialists into the core crew rather than underlying growth in crewing requirements. Extensive use of automated systems has allowed a reduction of around 30 sailors from the Type 23s in spite of the new class's greater size and capability.

### Export Prospects

One objective of the GCS project was to devise a design that had better export potential than recent RN warships. Whilst the sophistication and consequent high cost associated with a specialised anti-submarine frigate means that the GCS will remain beyond the means of many navies, it is potentially attractive to fleets needing this high-end capability. Accordingly, the GCS is currently pursuing two export campaigns with navies seeking anti-submarine warfare frigates. Both envisage the adaptation of an existing design for local production. The more advanced is Australia's Project SEA 5000 for nine future frigates. In April 2016 it was announced that the GCS had been short-listed alongside Fincantieri's FREMM and a derivative of Navantia's F-100 type for fur-

ther development to meet the Australian requirement. A request for tenders was issued to the three companies in March 2017 with a decision scheduled in 2018. Construction is expected to start at the Osborne yard in Adelaide during 2020 for delivery of the first ship within a 2027-30 timescale. The overall programme is valued at AU\$35Bn. Whilst all three designs have strengths and weaknesses, the Type 26 GCS's strong anti-submarine warfare emphasis provide it with strong credentials to meet Australia's needs.

The other campaign relates to Canada's requirement for 15 'Canadian Surface Combatants'. Its 2017 defence review affirmed commitment to both the programme and planned numbers at an estimated cost of up to CAD\$60Bn. Under Canada's 2010 National Shipbuilding Procurement Strategy, it has already been decided that the ships will be built by Irving Shipbuilding in Halifax, Nova Scotia. An existing warship design and combat system will be used to reduce risk and speed construction. After two extensions in the timetable, proposals from up to twelve overseas companies were expected by mid-August 2017. A decision should follow in 2018. It is likely that anti-submarine capabilities will feature highly in the ultimate selection, again favouring the GCS.

The GCS has also been mooted for other warship programmes, including a potential bid with German Naval Yards for the MKS180 project. It is understood ongoing developments in the German naval sector mean these discussions are 'on hold' at the present time.

### Conclusion

The start of Type 26 CITY Class construction will be a relief for the RN. The ability to field sophisticated anti-submarine capabilities is increasingly important in an era of renewed East/West tensions. The new ships will be particularly important in ensuring the safety of the new DREADNOUGHT strategic submarines and QUEEN ELIZABETH carriers on which much British defence spending is currently focused. Although sometimes criticised as expensive in headline comparisons with apparently similar ships, such comparisons rarely take account of the cost of the high levels of survivability and acoustic stealth that are inherent design features.

From an industrial perspective, the contract helps secure the future of the key shipbuilding complex on the Clyde and marks a significant investment in the UK's wider maritime supply chain. As of July 2017, 34 firms were on contract to the project, supporting 4,000 jobs throughout the UK. It also has significant input from firms across Europe and in North America. The prospect of exporting the GCS design provides additional potential. However, timely investment in the second CITY Class batch – as well as a positive outcome from the long-awaited UK National Shipbuilding Strategy – will be crucial for further progress. The ongoing political debate on Scottish independence remains a source of uncertainty.

Concluding with the words of Programme Director Geoff Searle, 'July 2017 has been a great month for the Type 26 programme. Lots of hard work has been needed across the workforce to achieve the level of design maturity now reached but it gives us significant impetus as we enter the build phase. We are well placed to deliver the ships the Royal Navy needs in a timely fashion and offer a competitive design to export markets'.

#### Notes:

1. This article refers to the British ships currently under order as the CITY class. The wider project – including potential export orders – is referred to as the Global Combat Ship.
2. The patrol vessels were largely ordered to maintain production at the Clyde yards whilst Type 26 construction was agreed.

# QUEEN ELIZABETH Class Aircraft Carriers: Programme Update

**Conrad Waters**

On 26 June 2017, QUEEN ELIZABETH – the first of the British Royal Navy’s two new aircraft carriers – departed Rosyth Dockyard near Edinburgh to commence sea trials. Her maiden voyage marked another step towards the regeneration of a capability lost with the retirement of the previous INVINCIBLE class and their Harrier jets. However, much remains to be done before the new carrier becomes operational.

The QUEEN ELIZABETH aircraft carriers trace their origins to design studies in the 1990s to identify replacements for the INVINCIBLE class. The 1998 Strategic Defence Review took the decision to procure two new strike carriers to replace the three, smaller INVINCIBLEs. However, subsequent progress to establish the capabilities and configuration of the new ships was slow. It was not until 2008 that a construction contract was awarded. This has been overseen by an Aircraft Carrier Alliance (ACA) comprising Babcock International, BAE Systems, Thales UK and the UK Ministry of Defence. The build-strategy involved the fabrication of the ships’ constituent blocks at yards around the UK, with final assembly at Babcock’s facility in Rosyth. Formal construction of the first ship started in July 2009.

The two ships have been built to a ca. 65,000-tonne, 280-metre-long design configured for Short Take-Off and Vertical Landing (STOVL) operations. This configuration was originally intended to support a notional strike-focused aviation group of 36 fast jets and four surveillance and control aircraft. The F-35B STOVL variant of the Lockheed Martin LIGHTNING II was selected to provide the fast jet capability. Design innovations included the use of distinctive twin islands to maximise flight deck area and provide redundancy with respect to key command and control functions. Considerable automation was specified to limit crew size to the same level as the previous INVINCIBLE class despite the major uplift in capability represented by the new ships.

## Author

**Conrad Waters** is a naval and defence analyst based in the UK. He is a regular contributor to ESD and Editor of Seaforth World Naval Review.

Photo: Royal Navy



*Christening of the HMS QUEEN ELIZABETH aircraft carrier.*

The design utilises an integrated electric propulsion (IEP) system. Rolls-Royce MT-30 gas turbines and Wärtsilä diesel generators providing power to GE Power Conversion advanced induction motors by means of an electrical distribution network.

There has been considerable fluctuation in programme requirements since the contract award. The UK’s 2010 Strategic Security & Defence Review (SDSR) considered cancelling the project outright as part of spending cuts. It ultimately decided to complete one ship to a revised Catapult Assisted Take-Off But Arrested Recovery (CATOBAR) configuration using the F-35C carrier variant. The other was to be held in reserve or sold. By the end of 2014 both these decisions had been reversed, with the SDSR 2015 review subsequently confirming a requirement to maintain both ships to ensure one was continuously available for operations. Meanwhile, although providing a carrier strike capability remains the class’s key function, a new Carrier Enabled Power

Projection (CEPP) concept envisages the embarkation of a range of tailored air groups comprising different mixes of aircraft.

## From Naming to Maiden Voyage

QUEEN ELIZABETH was christened by Her Majesty Queen Elizabeth II on 4 July 2014. She was subsequently floated out of her building dock on the 17th of the same month. Although structurally complete by this stage, considerable fitting out had still to be completed before the lengthy and laborious process of setting the ship’s equipment to work could commence. One complicating factor was the use of her building dock for assembly of her sister ship, PRINCE OF WALES. This prevented a return to the dry dock whilst final outfitting and harbour trials were underway. As a result, some significant work had to be carried out underwater. This included installation of the



ship's two 33-tonne propellers, which were fitted by divers after completion of initial tests of the IEP system conducted whilst the carrier was still berthed at Rosyth. The underwater installation was claimed to be a world first at the time.

The commissioning of QUEEN ELIZABETH's power and propulsion system was one of a number of key activities that needed to be completed before her crew could move onboard and the ship be declared ready for sea. Other strands of work included setting-to-work the various platform management and mission systems and underlying fibre optic cable network needed to ensure the carrier's safe operation as well as completing the more than 3,000 individual compartments located throughout the ship. The latter process was carried out on a phased basis, with the first compartment handed over to the ship's staff as early as February 2016. Another major challenge was preparing the flight deck and surrounding areas for the effects of the high temperatures generated by the F-35B's engine in STOVL mode. This included the application of a thermal metal spray coating to appropriate deck areas.

Given the complexity of the setting-to-work process, it is not surprising that challenges arose that delayed the ship's sea trials. Although no official schedule was ever released, it appears the initial hope was to start these by the end of 2016. However, the construction contract made allowance for some slippage. This required delivery by the end of 2017, a schedule which currently seems set to be achieved. By mid-2017 it was apparent that QUEEN ELIZABETH was approaching readiness for sea, with the crew moving on board on 26 May 2017. A simulated training cruise in early June prepared the crew for a range of scenarios that might be expected whilst underway and marked the final stage of preparations for the ship's maiden departure.

## Departure & Sea Trials

The successful completion of the simulated cruise allowed Monday 26 June to be set for the start of QUEEN ELIZABETH's trials. Local topography meant that the carrier's departure from Rosyth involved a complicated series of manoeuvres that could only be carried out within a given tidal window and in suitable weather conditions. More specifically, exit from the non-tidal basin in Rosyth Dockyard had to be conducted at high tide and with only inches to spare on either side of the basin's entrance. This evolution was completed on the afternoon of 26 June. Subsequently, the ship had to anchor in the River Forth until the tide fell suf-



Photo: UK MoD/ Crown Copyright

**An historic photo: HMS QUEEN ELIZABETH arrives at her home port of Portsmouth for the first time, with the Type 45 Air Defence Destroyer HMS DIAMOND close by and the masts of the 19th-century steam-powered, iron-armoured warship HMS WARRIOR visible in the background.**

ficiently for her to squeeze under the Forth Railway Bridge, the lowest of the three bridges linking Edinburgh with northern Scotland. Transit of the bridges took place shortly before midnight with less than six feet of clearance from QUEEN ELIZABETH's highest point and with an even shallower depth of water under her keel.

At the time of departure, the planned trials programme envisaged around six weeks of platform systems tests off north-east Scotland punctuated by a refuelling stopover at Invergordon, a former naval base on the Cromarty Firth. Afterwards, the carrier was scheduled to return to Rosyth for a six-week period of defect rectification and completion of additional work packages. She was then to sail for a second, shorter round of trials focused on her mission systems before heading south to her new home port of Portsmouth. This programme was regarded as being fluid dependent on the progress of testing.

Reports on the progress of trials to date suggest they have been broadly successful despite some inevitable teething troubles. These have included problems with watertight door mechanisms and the need to undertake minor rectifications to the ship's propellers. The latter enforced an extended stay at Invergordon whilst this work was undertaken. The ship was back at sea before the end of July, hosting a visit from British Defence Minister Sir Michael Fallon on 24 July. In a statement to ESD at the start of August, ACA partner BAE Systems said: "HMS QUEEN ELIZABETH is making good progress through her sea trials programme, which is designed to test the full spectrum of her systems. Her Ship's Company is looking forward to taking her to her home port of Portsmouth in the coming weeks." Shortly after, it was confirmed her maiden arrival had been accelerated to a window covering 17-22 August, the exact date being subject to weather conditions.

Considerable work has been completed at Portsmouth in preparation for the carrier's imminent arrival. This has included the dredging of a new channel to facilitate access to the harbour and completion of upgraded berthing facilities – the Princess Royal Jetty – to accommodate the class.

## Next Steps

The completion of QUEEN ELIZABETH's sea trials and her subsequent arrival in Portsmouth mark a major step towards regenerating British fixed-wing naval aviation. However, much work remains to be completed before an initial carrier strike capability – targeted for the end of 2020 – can be achieved. The building blocks for this capability include not only the carrier but also the F-35B jets and CROWSNEST airborne radar-fitted helicopters that will form her air group.

Following QUEEN ELIZABETH's formal commissioning, much of early 2018 will be taken up with helicopter operations trials. These should provide limited capability to operate battlefield helicopters. The autumn of 2018 should see the first F-35B flying trials from the carrier off the east coast of the United States. These will pave the way for a further, more extensive series of trials during 2019. The CROWSNEST radar system should be operational by April 2020 and a LIGHTNING II squadron ready for sea-based deployment later in the year, allowing initial operating capability for carrier strike to be declared in December 2020. Realisation of this schedule remains subject to considerable risk.

The achievement of full CEPP will not occur until later in the decade, when PRINCE OF WALES will also be fully operational. She will be formally named at a ceremony scheduled for 8 September 2017 and delivered in mid-2019. ■

# Common Optimism

## Anti-Ship Missile Manufacturers to Set New Standards



Photo: Saab

**Stefan Nitschke**

*The ship- and aircraft-launched RBS15 Mk3 anti-ship missile performs as a fire-and-forget system with a true re-attack capability.*

The big picture for anti-ship missiles has clearly changed in recent years, particularly because of the ramp-up of several new programmes to add a land attack capability.

### Common Need

The challenges can be taken from emerging threats ashore. To keep today's anti-ship capabilities in shape, naval forces need to find alternatives to avoid dramatic obsolescence risks, replacing huge inventories of legacy systems like EXOCET MM38s or HARPOONS/Sub-HARPOONS. The ways naval forces upgrade their surface, underwater, and airborne assets are changing almost as fast as new mission scenarios are evolving, including land attack. But how is that process going?

Arguably the biggest challenge is to replace the variety of systems that do not cope with present day needs: battlespace dominance (neutralisation of land and sea denial systems) and power projection ashore, directed at time-critical targets such as relocatable assets. For now, many systems in use with European navies must be upgraded or replaced by new multi-role systems. Newer candidates, like Kongsberg Defence Systems' NSM, are set to cope with the extended mission roles of the next generation of naval assets, including submerged platforms and shipboard aviation. The NSM or Naval Strike Missile is Norway's answer to the navies' growing demand for a longer range precision strike weapon. It will out-range many legacy systems: surface warships of any size and type can carry

NSM in its Vertical Launch (VL) variant – also named VL-JSM (VL-Joint Strike Missile); shipboard helicopters can deploy the air-launched version (JSM); road-mobile launchers ashore can employ the coastal defence variant of NSM to counter targets at sea; and submarines may be fitted with NSM-SL.

Kongsberg seems to be very happy with the development so far. "Every variant is optimised for its market," according to the manufacturer earlier this summer, adding that it is the world's only fifth-generation naval strike missile with a land target capability. This exactly positions NSM for the US Navy's anticipated LCS/FF (Littoral Combat Ship/Fast Frigate) missile competition. It calls for an over-the-horizon anti-ship and low-level, terrain-following land attack capability.

The development schedule for NSM as both Norway's and Germany's system of choice has been accelerated following the announcement by the countries' ministries of defence in February to extend naval co-operation from submarines to anti-surface missiles. The intention is to jointly develop, procure, and operate the NSM in both navies, the value of the NSM sale to Germany is estimated at NOK10BN (~€1.057BN). There is one principal reason for selecting NSM: to react more flexibly to a wider range of threats with a single anti-ship/land attack weapon.

Several other modernisation efforts among European NATO partners appear to be promising. France and the United Kingdom (UK) are buying a common design for their shipboard rotary-wing assets, named SEA

VENOM/ANL (Anti-Navire Léger). The new anti-ship weapon, according to MBDA's announcements in 2016, is completing qualification ahead of an expected delivery to the Royal Navy in late 2020, equipping Leonardo AW159 WILDCAT helicopters. The new missile is intended to replace SEA SKUA rounds in the Royal Navy and the AS-17 TT in French Navy service. Its combat range was quoted at 20 km (10.8NM). SEA VENOM reached crucial milestones last year and earlier this year, including air carriage and jettison trials that were carried out from an AS365 DAUPHIN helicopter from the French DGA military procurement agency in June. MBDA confirms it has started the integration process on the LYNX Mk8.

It is interesting to note that a number of SEA SKUA operators – Brazil, Germany, Kuwait, Malaysia, South Korea and Turkey – need to replace their existing inventories with a newer helicopter-launched over-the-horizon anti-ship weapon system.

### Often Underestimated

"Some of that money navies want to invest in an enhanced [anti-ship/land attack missile] capability is going to Saab's RBS15 Mk3," a Saab representative said. Although it is a much heavier missile system than the NSM, thus sometimes complicating aircraft installation, it has attracted the interest of a number of countries, including Germany, Poland, and Croatia. Saab's RBS15 Mk3 success in Poland, equipping ORKAN Class fast patrol boats, allows it to continue to grab a significant market share.





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Royal Norwegian Navy,  
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Photo: Kongsberg Defence Systems



**The truck-mounted NSM CDS (Coastal Defence System) delivered to the Polish Coastal Defence Missile Battalion**

The Mk3 variant, jointly produced and marketed by Saab and Diehl Defence, utilises a pre-launch programmable active radar seeker to provide a high hit probability at sea and ashore under adverse weather conditions. Its operational range is quoted to be in excess of 200 km (>108 NM).

Sales of anti-ship missiles are often underestimated. European primes like Kongsberg, MBDA and Saab account for a significant chunk of the global market, with some sources quoting a combined total of 54-55% in 2014 and 60.5% last year. ESD learned that the Asia-Pacific region is about to emerge as a market for new systems offered by Kongsberg and Saab. "In the future, you will see Saab working with many more customers in Asia as you will with those in Europe," Saab insisted. Additionally, with Algeria, Egypt, Morocco, Oman, Saudi Arabia, and the United Arab Emirates (UAE) outfitting their surface assets and shipboard aviation with newer weapons, numbers in the Middle East North Africa (MENA) region could significantly surpass past levels in the upcoming five to six years. MBDA is currently producing the latest version, EXOCET MM40 Block 3, for customers in the region.

Still a conceptual design, MBDA's HOPLITE system is set to offer an indirect precision attack capability for naval ships from 2035. It could represent a viable alternative for a VL missile providing the next generation of surface ships (e.g. Type 26) with greater lethality than many other weapons utilised for the neutralisation of land and sea de-

nial systems. Encompassing two variants, HOPLITE-L and HOPLITE-S, the concept addresses cooperation in the air: one loitering to provide laser designation for the

LITE-L weighs around 135 kg, measures 3.75 m in length, and travels up to 140 km (75.6 NM) at speeds between Mach 0.6 and more than Mach 3.0. HOPLITE uses an innovative Air Turbo-Rocket (ATR) propulsion system that enables supersonic flight and subsonic dwell (loiter) for operator-in-the-loop targeting, said MBDA.

MBDA scored additional successes over the past several years, 18% more than in the early 2000s. That figure also included the MdCN-NCM (Naval Cruise Missile) on delivery to the French Navy and the 30 km (16.2 NM) range MARTE Mk2/N ship-launched anti-ship missile system supplied to Qatar, Turkmenistan, and the UAE.

## Challenging Technology

The surface ship-launched NSM is just the beginning: Because VL-JSM is considered to be compatible with the US Navy's Mk41 Vertical Launching System (VLS), it could directly compete with the 560 km (302 NM) range Long-Range Anti-Ship Missile (LRSAM) currently under development by Lockheed Martin. The US Navy, the principal user of 1980s era HARPOONS and TOMAHAWKS, is looking to a new generation of fast, long-range strike missiles that "can be used by practically

Photo: DGA



**SEA VENOM/ANL can be fitted to a variety of naval helicopters, including the AS365 DAUPHIN (shown), LYNX, SUPER LYNX, NH90 NTH, and AW159 WILDCAT.**

other before striking its own target in some scenarios. MBDA intends HOPLITE-L to direct mixed-salvo strikes via its data-link and laser designator. Slightly heavier and a little shorter legged than the S-model, HOP-

the entire surface and submarine fleet," the service stated, challenging the naval audience following the first test to evaluate the stealthy LRSAM in February 2015. A development based on the AGM-158B



JASSM-ER (Joint Air-to-Surface Standoff Missile) in service with the US Air Force, LRSAM, part of the Offensive Anti-Surface Warfare (OASuW)/Increment 2 anti-ship missile, will be used only as an air-launched missile, to be deployed from the B-1B LANCER, with the Initial Operational Capability (IOC) expected in 2018, and the F/A-18E/F SUPER HORNET by mid-2019. The US Navy officially designated the air-launched variant AGM-158C in August 2015. Sweden has expressed interest in the LRSAM in response to concerns at Russian actions in Eastern Europe and other potential users, according to industry sources, may include Australia, Canada, and the UK.

Diehl Defence in Germany, faced with cancellations of its fibre-optic guided missile in the 1990s and with the small quantity of RBS15 Mk3s delivered to Germany, is "still progressing" with the IDAS (Interactive Defence and Attack System for Submarines) concept. Following an equally slow start for IDAS' entry, mainly due to political and budgetary reasons, and issues surrounding navy tactics, the consortium plans to accelerate its marketing activities, with Norway and Turkey representing an interesting market.

IDAS is grouped as a short-range strike missile incorporating Man-In-The-Loop (MITL) guidance, able to strike targets ashore over 20 km (10.8 NM) away. The IDAS Consortium, originally formed by thyssenkrupp Marine Systems and Diehl BGT Defence, has already conducted the first ejection trials with the submarine-launched IDAS missile system in Norwegian waters, with the Royal Norwegian Navy's ULA class diesel-electric submarine HNoMS UREDD (S 305) serving as the launching platform. A full launch demonstration from a German Navy Type 212A submarine demonstrated the missile's ability to be torpedo tube-launched, breaking through the water surface, and flying by keeping linkage to the launch platform via a fibre-optic cable.

Another big talking point is technology for enhancing missile performance. Inertial Measurement Units or IMUs, based on MEMS (Micro-Electromechanical Systems) gyro technology, can significantly improve a missile's pin-point precision. "The most challenging technology of any missile system is guidance and seeker and/or sensor technology," Hans Richard Petersen, Vice President Sales & Marketing at Sensoror AS in Norway, told ESD on 14 August. "[...] in the end, [it] defines the efficiency of a missile," he added. One of the company's products, the STIM300 IMU is closing the performance gap to FOG (Fibre Optic Gyro). "For the STIM300, we see a number of applications, including [...] missile stability and navigation [...]," he said. The same affects the STIM210 three-axis gyro module that has been selected to mitigate effects of wave motion of a remote-controlled variant of MBDA's SIMBAD twin launcher system. "MEMS gyros will continue to advance in performance," Petersen concluded.

## Conclusion

Making use of the new generation of anti-ship/land attack missiles requires a complete change in the way navies view Anti-Surface Warfare (ASuW). Though, key decisions are to be taken into consideration over large-scale procurement efforts aimed at improving navies' capabilities chiefly in the fields of anti-ship and deep-strike needs. The latter was assigned renewed relevance in recent years due to the fact that engaging hostile forces ashore often failed to succeed. New technologies, among them guidance/seeker concepts and low observable (stealth) methodologies, are about to transform the anti-ship/land attack missile into a deadly opponent. This also affects the new generation of loitering munitions, which utilise a common core design with adaptable modular elements (seeker, warhead, propulsion system), replacing entire families of heavier, near-obsolete missile systems. ■

# GYRO

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# Projects and Programmes of the NCI Agency

**Dorothee Frank**

The last decade has seen an impressive advance in the digital field that is leading to more possibilities, capabilities, chances, challenges and threats. To keep on track with civil industry and solutions, the NCI Agency has also seen a rise in its personnel, finance and importance. Several new technology fields are actually the focus of the NCI Agency's future improvements and topics, and are thus enhancing the effectiveness of NATO.

One of the most important fields for the future might be the NATO app store. "Several Nations, including the United Kingdom and the Netherlands, have already made a policy to re-use existing NATO solutions to save on national investments while at the same time ensuring interoperabil-

US Special Operations Command Europe have signed a licence agreement with the NCI Agency for the delivery of the NST." The aim of the project is to replace the manual software delivery process, which most NATO nations are using at the moment, with a modern toolset providing fast

and best practices in line with the "Cloud First" approach stemming from the NATO Cloud Computing Policy. Introducing public cloud technologies is breaking new ground for the NCI Agency and NATO, resulting in policy and procedures being adapted."



Photo: U.S. Army

***Afghanistan has been the testbed for many communication and information sharing solutions.***

ity with NATO systems. The solutions are also available to NATO Partner countries," NCI Agency's Electronic Definitive Media Library team explains, describing said app store. The original project name of the NATO app store is the Electronic Definitive Media Library (EDML). The team continues: "The NATO Software Tools (NST) initiative covers 19 NATO software tools that can be used for free by NATO Nations for testing, evaluation and operational purposes. Consequently, 25 NATO Nations, six NATO Response Force units, US Army Europe and

and reliable services. The service is now up and running, and it has already been used to distribute NATO. It is also used to support operations such as patch management, and NATO Response Force exercises. The EDML team describes: "In developing the project, the Agency focused on agile development, minimising costs. The project is another step forward in NATO embracing the creative use of cloud solutions. The EDML is implemented in the public cloud and Agile (SCRUM) development based on three iterative Sprints with DevOps tools

## Quantum Computing

One of the new technologies that is most hard to understand is "quantum" and its impact on technology. As most people know, a computer uses lines of 0 and 1 to describe, memorise and calculate everything. Quantum computing means that every value can be both: 0 and 1 are the same. It is like Schrödinger's cat. The Austrian physicist Erwin Schrödinger had described quantum mechanics with a cat in a box. The cat can be alive or dead and in "quantum" it is both dead and alive, which is called quantum superposition. Only when an observer looks into the box, will the cat be either dead or alive. Some very intelligent scientists are working on combining this quantum superposition with the binary code of computers – and they have already made some very impressive progress.

Quantum technology surely leaves the realms of what men are able to understand – apart from maybe two handfuls of scientists worldwide – but the effects lead especially to an impressive increase in possible calculation capacities. Therefore it poses a threat to cryptology, which is not only essential for the modern military but also relies on the assumption that the needed factoring of large numbers outreaches the capabilities of available computers. The NCI Agency has therefore been working on the concept of "quantum-safe" cryptography for some years now. According to the NCI Agency, quantum-safe algorithms have already been developed and equipment using these algorithms is beginning to become available commercially.



Due to its high processing capabilities, quantum computing will also enhance the protection to networks against attacks through Quantum Key Distribution (QKD). The NCI Agency explained that, "the same quantum principle of QKD can be applied to the entire communication network. A 2,000 km quantum communication link now operates between Beijing and Shanghai, demonstrating the concept is viable for long distances. In August 2016, China also launched a satellite purported to be able to generate and distribute quantum encryption keys from space. Most current technology addresses point-to-point communications, as using this technology for many-to-many network connections is complex. However, there is significant research activity in this area from both the government and commercial sectors, so rapid advances will happen."

## Communication

Even though the NCI Agency believes that the aforementioned projects signpost the future of technology, the bread-and-butter business is still communication, with satellite communication as the core



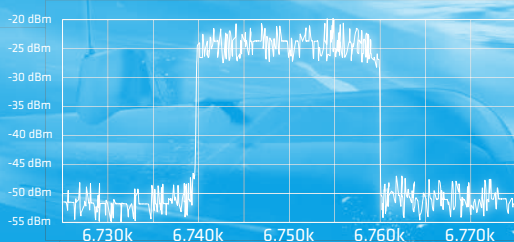
Photo: NATO

**In 2014, NATO and Russia started to develop a remote medical services system using Russia's advanced national telemedicine system, which includes satellite communication in order to be able to respond to emergency crises over large distances.**

system for connecting deployed forces. The construction of satellite hubs with two Satellite Ground Stations (SGSs) in Kester, Belgium, and Lughezzano, Italy, is being undertaken by the NCI Agency

to provide this critical connectivity. The NCI Agency said: "Later this year, the NCI Agency will be competing a major contract, worth some €1.5Bn for satellite bandwidth capacity, as well as a €200M

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***In international operations soldiers need technology that can be simply accessed by allied forces.***

contract for satellite terminals to support NATO's Response Force, designed to deploy anywhere in the world at short notice." Dr Gregory Edwards, Director of Infrastructure Services at the NCI Agency

said about the importance of satellite capabilities for NATO: "We have a static infrastructure that provides connectivity to our Commands throughout NATO, located throughout our 28 nations. That

static piece is one we sustain from day to day, and an important piece of that static communications is satellite. Deployments for operations have become a somewhat primary use of satellite communications for NATO. We depend on Industry heavily. Of course, we do have our ability from a ground infrastructure perspective to allocate bandwidth and do the separations that are necessary to get our abilities to deployed forces."

Other communication efforts focus on standardisation, in order not only to make communication possible, but also to share information. Since the very first Afghanistan Mission Network, information sharing has been a core aspect for all projects, added by a Cloud-First premise in recent times. Supreme Allied Commander for Transformation (SACT) General Denis Mercier said in an interview with Nadja El Fertasi from the NCI Agency's magazine Communicator: "When thinking in terms of desired effect, cloud-combat platforms combine the different domains – land, air, sea and cyber – to ensure we deliver the appropriate effect. For me, the key combat system is C4ISR and how we associate these different capabilities. If we look at a single platoon for instance, it has many sensors on the ground. But how are we fusing this vast amount of information using artificial intelligence and re-distributing this intelligence at the appropriate levels?" Mercier answered his own question with the capabilities offered by Federated Mission Network, the follower of Afghanistan Mission Network. About the core element of communication – and therefore the core element of the NCI Agency's efforts – Mercier pointed out: "Interoperability standards are essential, which is why we are developing Federated Mission Networking (FMN) to ensure interoperability between the different national systems. In Iraq, for example, this is not a NATO operation, but all the forces can operate together because they use NATO standards. That is the value of it, knowing that when we deploy together, we will link up our systems, and it works." ■

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# “Speed of Light to the Fight”

## Promise and Prospects of Directed Energy Weapons

**Sidney E. Dean**

**Directed Energy Weapon Systems (DEWS) engage targets with various forms of electromagnetic energy. Theoretically, the term includes particle beam and plasma weapons, but for now these remain conceptual. Practical DEWS applications are currently restricted to High Power Microwave (HPM) and laser systems.**

Advantages attributed to all DEWS include the precision to disable targets without a significant risk of human casualties or collateral damage. Other shared attributes include the following: much lower operating cost (frequently cited as “a dollar per shot”) when compared to kinetic weapons; the “deep magazine” aspect

hypersonic weapons. This attribute led the US Air Force Research Laboratory (AFRL) to coin the phrase “light to the fight”. One current disadvantage of all DEWS is the fact that power generation systems for these weapons still tend to be large and heavy. Improving the Size, Weight And Power (SWAP) ratio is therefore one major avenue

vehicle engines, missiles, air defence, C4ISR and sensor systems, as well as electronics embedded in combat vehicles or carried by infantry (e.g. GPS, targeting systems). Potential naval applications include a microwave self-defence system that would disable incoming anti-ship missiles.

Microwave emissions can be narrowly focused on a particular target or target area, or be sent out in a wide arc to effect targets spread over a greater air or ground sector. The beam can penetrate unshielded walls and strikes too quickly for safety mechanisms such as surge protectors or circuit breakers to react. The US armed forces are working on several HPM weapons.

The Counter-electronics High-power-microwave Advanced Missile Project (CHAMP) was developed by the AFRL, Boeing and Raytheon. The weapon emits high power microwaves for a fraction of a second, creating an electro-magnetic pulse (EMP) that overloads and destroys electronic circuits (alternately the power can be scaled down in order to temporarily shut down electronic systems without destroying them). In contrast to EMP created by aerial detonation of a nuclear weapon, CHAMP's energy is emitted as a tight beam which can be directly aimed at a designated target building. This allows selective neutralisation of key military assets without blacking out civilian infrastructure. Also in contrast to an airburst weapon, CHAMP can fire multiple times during a mission.

The emitter can be attached to a variety of manned and unmanned platforms; any carrier platform will need to be customised to withstand the potential effects of the EMP on its own systems. CHAMP was successfully tested in 2012 on board an AGM-86 Conventional Air-Launched Cruise Missile. The missile loitered over the test range for an hour, sequentially attacking seven different targets where it disabled computers, electronics and surveillance cameras. In May 2015, AFRL commander Major General Tom Masiello described CHAMP



Photo: USN

**US Chief of Naval Operations Admiral John Richardson is briefed on General Atomics' research toward a 150 kW laser demonstrator.**

(DEWS can hypothetically operate as long as there is fuel to generate electricity for the weapon); the level of damage can be selectively controlled by varying the energy intensity of the beam (scalable effect); the attack is silent and invisible, preserving the element of surprise and potentially damaging enemy morale. Related to the latter point is the fact that DEWS' energy beams travel at light-speed, making them ideal for engagement of moving targets including

of research. Improving efficiency, measured as the percentage of energy created by the weapon system which is actually translated into the energy beam, is another priority. Numerous nations are developing DEWS. The United States military alone is allocating US\$3.4Bn for DEWS programmes over the next five years. The Pentagon is also working on its first Directed Energy Weapon Roadmap, which will be published in March 2018.

### Author

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### Microwave Weapons

Microwave weapons emit energy pulses which overload electronic systems in the targeted area, shutting them down and destroying the circuitry. This can disable



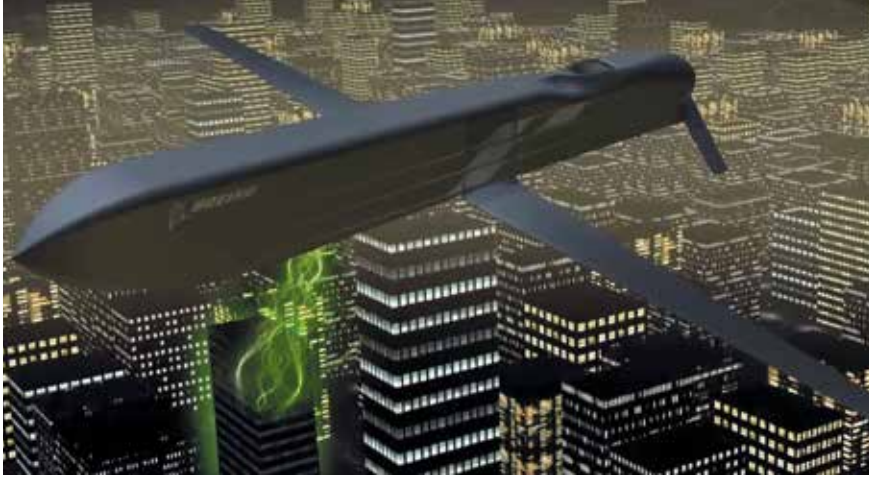


Image: Boeing

**CHAMP is the first microwave weapon to become operational with the US armed forces.**

as "an operational system already in our tactical air force". As far as publicly known, only five systems have been procured to date. AFRL continues work to improve the SWAP ratio. Current planning is to deploy the miniaturised CHAMP on the Joint Air-to-Surface Standoff Missile – Extended Range (JASSM-ER).

While CHAMP is designed for highly selective targeting, there remains interest in a non-nuclear EMP weapon with blanket effects over a limited area. Such a weapon could "soften up" large enemy formations before an assault, or isolate hostile forces in control of urban areas without long-term damage to civilian infrastructure. In November 2016 the US Army released a solicitation for a "Munitions Delivered Non-Kinetic Effects" system intended to deliver "non-kinetic RF effects against a wide range of electronics, critical infrastructure, and computer-based systems." The payload is to be delivered via 155mm howitzer. The solicitation cited recent advances in munitions-based microelectronics and power technologies which are expected to make development of the desired system possible.

Other HPM/RF research projects include boat- and shipboard systems as well as vehicle-mounted systems, all to be used in force protection roles. Some of these projects are tuned to stopping oncoming vehicles and vessels, while others use non-lethal, pain-inducing microwave frequencies for crowd control and deterrence.

While the US military is considered to be leading in the development of HPM weaponry, other nations are also pursuing this option.

Chinese media report that Beijing is working on a system similar to CHAMP. The Chinese weapon – which is allegedly not yet operational – is intended to stop missiles and ground combat vehicles including tanks. The emitter is said to be small enough to fit on vehicles, manned and unmanned aircraft, or missiles.

Development of EMP weapons is one goal enumerated in the Indian MoD's 15-year "Technology Perspective and Capability

Roadmap" presented in 2013. Researchers are seeking ways to adapt the science-grade KALI particle accelerator for use as a microwave weapon (primarily for missile-defence purposes) including possible miniaturisation to develop an aircraft-borne weapon. Indian researchers admit that practical military application of this system is still many years out.



Photo: Lockheed Martin

**In 2015, the 30 kW Advanced Test High Energy Asset (ATHENA) destroyed the engine of an unarmoured small truck.**

Russia, meanwhile, claims to have operational microwave weapons. Vladimir Mikheev, a director of the state-owned Russian electronics firm KRET, cited a range of "tens of kilometres" in a 2016 interview with TASS. Mikheev said Russia intends to mount the weapon on unmanned 6th Generation aircraft expected to enter service circa 2025. The potential danger of the microwave radiation to humans would preclude deploying the weapon on manned aircraft, he said.

### Mobile Tactical Laser Weapons

For the past decade most laser weapon research has centred on electric Solid State Lasers (SSL) – especially fibre lasers – which offer the most favourable SWAP ratio of all laser types. The past five years have seen significant progress in weapons develop-

ment. This is partly the result of progress in component technologies such as microelectronics, power systems, and optics, sometimes borrowed from other industries. For example, advancements in fibre optic communications and from industrial laser drilling and cutting applications have been adapted to improve beam-combination techniques. Video game technology has been leveraged to improve beam control systems.

Further improvements in power production and management, SWAP ratio and beam control are expected over the next few years. First generation tactical High Energy Laser (HEL) weapons are expected to enter service by the mid-2020s. Initial applications will primarily be defensive. As more powerful HELs mature, their mission profile will expand to include defensive and offensive operations against more sophisticated targets.

Lasers do come with inherent limitations: the weapon requires line-of-sight to the target; while range is theoretically farther than that of kinetic munitions (with the exception of missiles), beam cohesion suffers with distance, reducing effectiveness; atmospheric conditions (moisture, dust, smoke) can impair beam cohesion; even white or reflective paint on the target can negate laser effects. Lasers mounted on moving platforms are further subject to vibration which can impede aiming and beam cohesion. To counteract these liabilities research on tactical laser is not solely concentrated on improving power and beam generation, but also on beam control technology as well as weapon integration with platforms and sensors.

### US DoD

From an investment perspective and with regard to the volume of research, the United States Department of Defense (DoD) is

the global leader in laser weapon development. DoD's High Energy Laser Joint Technology Office (HEL-JTO) coordinates research and testing projects involving multiple government agency, academic and industry partners. In 2012 HEL-JTO devised the Robust Electric Laser Initiative (RELI), pursuing technologies to enable the fielding of laser weapons on mobile platforms. Each service has its own priorities and applications for HEL weapons; for that reason each service is pursuing its own research under the RELI programme, in coordination with the HEL-JTO and with the Pentagon's Defense Advanced Research Projects Agency (DARPA).

### US Army

The US Army has been testing vehicle mounted HEL weapon demonstrators since 2011, and currently has several test projects running. To date experiments have been

mounts a 10 kW SSL and an Army developed agile beam control system. In April, HELMTT participated in a tactical field exercise during which it was integrated, for the first time, into the Army command and control network. The laser is being replaced with a new 60kW Lockheed Martin system which has proven highly efficient, translating 43 percent of energy output into the actual laser beam.

- Mobile Expeditionary HEL (MEHEL): A 5 kW laser developed by General Dynamics is in testing as a CUAS mobile force protection weapon mounted atop STRYKER infantry carriers; the laser will be upgraded to 10 kW this year. General Dynamics has stated that it could have an 18 kW version available for IOC in 2018.
- High Energy Laser Tactical Vehicle Demonstrator (HEL TVD): Initiated in 2016

developed concepts for a 30-50 kW system with an appropriate beam control system on a STRYKER platform, which is very capable against UAS," said Adam Aberle, head of the Army's HEL technology office. "It is not going to be really capable against harder targets with very short times of flight," Aberle said last August.

### USMC

The US Marine Corps is researching lasers for its Ground Based Air Defence programme, using a HUMVEE-mounted short-range 30 kW laser as testbed. The USMC also plans to mount laser weapon pods on KC-130 gunships and, once sufficiently miniaturised, on F-35 attack planes and AH-1 COBRA attack helicopters.

### US Navy

The 30 kW Laser Weapon System (LaWS) was installed aboard the former amphibious



Photos: US Army

**Photo left: While the designation HELMTT was adopted in 2016, a vehicle-mounted laser testbed has been deployed since 2010. The original HEL Mobile Demonstrator (HEL MD) was a 10 kW commercial welding laser paired with the Army's HEL TD beam control system, both mounted on a truck. During testing in 2014, the HEL MD successfully engaged 150 targets including 60mm mortar rounds, class 1 and class 2 UAVs, as well as ground targets representing fuelling and ammunition stations. Photo right: The Mobile Expeditionary HEL is a US Army programme to develop mobile force protection against UAVs. The system is designed as an add-on to tactical vehicles, such as the STRYKER infantry carrier. Demonstrations began with a 2 kW laser which was upgraded to 5 kW and will soon operate at 10 kW.**

geared toward force protection applications such as Counter (short range) Rocket, Artillery and Mortar (C-RAM) and Counter-UAS (CUAS), although test lasers have also destroyed the engines of unarmoured light trucks. Ultimately a high-powered operational HEL should be able to down cruise missiles.

- HEL Mobile Test Truck (HELMTT): Since 2016, this system has collected more than four terabytes of data on laser propagation in varying environments. The Army's stated goal "is to integrate and demonstrate maturing technologies to the point where lethal engagement in a relevant environment can be demonstrated." The vehicle currently

and classified as a pre-prototype system, HEL TVD will host a 100 kW HEL on a medium-sized tactical truck. The objective is to develop and mature laser technologies that will transition from technology development into engineering and manufacturing development of a high-power tactical laser to be mounted on a STRYKER or BRADLEY-sized vehicle. The weapon would serve for C-RAM, CUAS and cruise missile defence. HEL TVD testing is scheduled for 2022 and could transition to an acquisitions programme.

While the Army will accept interim operational systems in the 30-60 kW range, the end-goal is a 100+ kW system. "We have

ous warship USS PONCE in 2014 for testing and destroyed or disabled all UAS and speedboat targets at several kilometres distance. LaWS remains on the ship as an authorised self-defence system, making it the first operational tactical laser weapon fielded by the US armed forces.

The Navy plans to fire a 150 kW laser aboard the self-defence test ship USS PAUL F. FOSTER this year and from an aircraft carrier or destroyer in 2018. This Maritime Laser Weapon System (MLWS) concept demonstrator developed by Northrop Grumman is designed to destroy incoming anti-ship missiles. Northrop described it as "near-term operational" and states that MLWS could be installed aboard ARLEIGH



BURKE Class Flight II destroyers with minimal modification.

The Navy's long-term goal is to field lasers on a wide variety of warships to destroy boats, missiles and aircraft, and to integrate laser weapons into the AEGIS combat system. On vessels other than aircraft carriers or electric drive ships a HEL weapon will require power storage modules to provide surge energy. DRS Power and Control Technologies reports development of a battery system holding energy for 100 laser shots.

### US Air Force

According to the AFRL, laser weapons have demonstrated sufficient technical maturity to permit operational integration on air platforms within the next decade. The US Air Force (USAF) currently has two laser Advanced Technology Demonstrators running:

- The Self-protect High-Energy Laser Demonstrator (ShiELD) will test integra-

Fighter and ground attack aircraft will utilise laser pods carried on external hardpoints. Initial applications would be aircraft self-defence against missiles. As power, precision and range improve, additional missions would be added: terminal phase ballistic missile/hypersonic missile defence (including homeland defence), aerial com-

tomatic weapon with an internally carried pallet-mounted 150 kW HEL. As an interim solution AFSOC may begin with a wing-mounted laser pod, and/or lower-grade weapons (60-100 kW). Proof-of-concept testing of a laser weapon on board an AC-130 is scheduled to begin next year.

Innovative concepts could enhance performance. USAF chief scientist Greg Zacharias cited such examples as synchronising laser weapons with optics from a telescope to improve tracking of fast moving targets. Alternately, the aircraft's phased array radar and the laser could be connected by synchronising their wavelengths, said Zacharias. And Lockheed Martin has already produced a turret which will allow 360 degrees of fire, as well as counteract turbulence.

### MDA

The US Missile Defense Agency (MDA) is interested in developing airborne HEL weapons to destroy ballistic missiles in their boost phase. The laser would be carried by high-altitude, high-endurance UAVs. The agency plans to deploy a low-power laser demonstrator mounted on a REAPER UAV in 2021 to test target discrimination and other issues surrounding high-altitude deployment of a laser weapon. The MDA has requested concept and technology proposals from industry. Lockheed Martin has proposed mounting the operational laser on an unmanned variant of the high-altitude U-2 reconnaissance plane.

### Global

As with microwave weapons, the United States is but one nation pursuing battlefield laser technology. Research is most active in Europe, Russia and Asia. For example, Rheinmetall is testing land- and seabased high-energy lasers in conjunction with the German Bundeswehr. The most recent project is Dragonfire, a 50 kW HEL defensive weapon demonstrator for British land- and sea-forces. As announced in January, the Dragonfire prototype is being developed by a European consortium led by MBDA, and will be completed in 2019. ■



**The Missile Defense Agency terminated its first attempt to develop an airborne high-power laser to combat boost phase ballistic missiles in 2011. The test weapon consisted of a chemical laser mounted on a Boeing 747 and firing through a nose-turret. The programme failed because the chemical laser proved both too weak and too cumbersome for practical application.**

Photo: MDA



Photo: USN

**The LaWS (Laser Weapon System) was installed on the Afloat Forward Staging Base (Interim) USS PONCE (AFSB(I) 15) for operational demonstration in 2014 and deployed to the Arabian Sea. Formerly an amphibious warship, the USS PONCE was chosen because it provided sufficient room for the weapon's bulky power generation system. Future operational laser weapons will be more compact.**

tion of a compact, medium-powered laser-weapon pod on a fighter aircraft for defensive use against ground-to-air and air-to-air weapons. Flight testing is expected to begin 2020/2021.

- The Demonstrator Laser Weapon System (DLWS) will be tested jointly with DARPA. It will integrate DARPA's 150 kW High Energy Liquid Laser Area Defence System (HELLADS) with the Army's beam control system in order to conduct ground tests against rockets, mortars and surface-to-air missiles, to determine an aircraft-mounted laser's potential against such targets.

AFRL plans to have an airborne laser programme of record in place by 2023. USAF aspires to two different airborne lasers.

bat, and ground/sea-surface attack. Defensive laser pods could also be carried by bombers and transport aircraft. Pods might carry their own batteries as a power source; this would alleviate the need for modifications to the carrier aircraft and allow any plane with external hardpoints to accept the pod. While initial pods might be restricted to 30 kW output or less, the ultimate goal is to field 100-150 kW systems, as stronger lasers destroy targets more quickly; this is essential when both the target and the platform aircraft are fast and manoeuvrable.

The US Air Force Special Operations Command (AFSOC) is planning to install a laser ground attack weapon on AC-130 gunships. The goal is to replace the 30mm au-

# Weighty Decisions Over Heavy Helicopters

**Andrew Drwiega**

Replacing the German Air Force's (Luftwaffe) ageing fleet of Sikorsky CH-53GA/GS helicopters through the Heavy Transport Helicopter (Schwerer Transporthubschrauber, or STH) programme is proving to be quite a headache for the German government.

The contenders for the expected €4Bn order are Lockheed Martin/Sikorsky with the CH-53K KING STALLION, a new design based around the successful CH-53 series, Boeing CH-47F – the latest version of its own legendary CHINOOK – and potentially a new entrant through Airbus' development of the twin-engine X6 single rotor helicopter which is currently at the concept stage.

What initially began around 2003 as a European requirement identified by both the German and French armed forces and support by the European Defence agency (EDA), which does not itself acquire equipment, failed to get any funding commitment at the time due to falling defence budgets across Europe, not to mention the ongoing cost of unifying east and west Germany that began in 1990.

Now after more than a decade, the need to replace the Air Force's fleet of around 60 CH-53G/GS has become a more immediate priority. While this is a "big ticket" item for the German Ministry of Defence, particularly at a time when defence spending in real-terms is not growing, there are problems not only in terms of which platform to acquire, but also from industry's standpoint, who will provide the through-life support which is usually as valuable as the acquisition, particularly when a platform such as this remains in service over any length of time.

The German aviation industry, predominantly led by Airbus, is fighting hard to retain what has been a central role in the maintenance, repair and overhaul (MRO) of the existing fleet. When the decision was made back in 1968 to buy a heavy lift helicopter for the German Army, and the deci-

Photo: Sikorsky



**The Sikorsky CH-53K KING STALLION heavy lift cargo helicopter is one candidate for German procurement.**

sion then as now was between Sikorsky's CH-53 and Boeing's CH-47 CHINOOK, all but two of 110 helicopters were built in Germany under licence by VFW-Fokker. Since then Airbus has provided the main MRO services to keep the heavy lift helicopter updated in terms of new engines, avionics and mission systems.

## Airbus and the CH-53

In 2002, Airbus (then Eurocopter) undertook an upgrade worth around €23M of 38 CH-53G to CH-53GS (Special) which was placed by the Federal Office for Defence Technology and Procurement (BWV). This would ensure that they could fly in IMC (Instrument Meteorological Conditions) and the order was to be completed by the end of 2005.

In 2012, another upgrade saw Eurocopter deliver the first of 40 modernised CH-

53GAs to the Bundeswehr at a ceremony at the ILA Berlin Airshow. The helicopter was received by Army Aviation Commander then-Brigadier Reinhard Wolski and was designated CH-53GS.

Ralf Barnscheidt, senior vice president of Eurocopter Germany and head of the Military Support Centre said at the time: "This CH-53GA upgrade is an impressive example of our close and fruitful partnership with the Bundeswehr, which has seen us working together to implement necessary improvements for the helicopter's future mission requirements."

Airbus was able to use its continuing upgrade of the CH-53GA as a tie-in to install avionics and communications systems which were "approved for use alongside the TIGER support helicopter and NH90 transport helicopter." The upgrade added a four-axis autopilot with auto-hover automatic flight control system, an electronic

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Photo: US Army

**A CH-47F CHINOOK helicopter lifts off with an M1114 up-armoured HUMVEE during slingload training.**

warfare system, and a glass cockpit with five multifunction displays. Specific mission equipment packages now available to the aircraft included forward looking infrared (FLIR) turrets, a satellite communications package, and range extending auxiliary fuel tanks.

### More Work for Airbus

More recently, in February this year the Federal Office of Bundeswehr Equipment, Information Technology and In-Service Support (BAAINBw) awarded Airbus an obsolescence management contract to retrofit 26 CH-53s (20 CH-53GS and six CH-53GE) with new components and up-to-date parts. The contract is valued at €135M and will focus on replacing outdated parts and those that are no longer manufactured or replaceable. All of the helicopters will also receive a new cockpit with multifunction displays, a new radar altimeter and autopilot. The plan is to extend the life of these helicopters out until the early 2030s. Beginning this year, the obsolescence management programme contract will run through to 2022 and work will be carried out at Airbus Helicopters' Military Support Centre in Donauwörth, Germany. The statement made by Wolfgang Schoder, CEO of Airbus Helicopters Germany, speaks to what is truly at stake for the German contractor: "This order enables both the German Armed Forces (Bundeswehr) and also our Donauwörth plant to plan ahead with certainty," he said, adding "Airbus Helicopters has been the German specialist for maintaining, repairing and

modernising heavy transport helicopters for decades. We have the necessary infrastructure, highly trained professionals and can guarantee supply for all Bundeswehr models." Airbus will fight hard to ensure that it has a future in maintaining heavy helicopters, whether they be foreign built aircraft or those yet to come.

Airbus' Military Support Center plays a significant role in the support and servic-

lobbying strategy of the government and even push for a commitment which would allow it to turn its X6 from concept into a programme.

### The Options

When the German Air Force took over operational control over the Army's CH-53G helicopters the majority (around 48) were allocated as Helicopter Wing 64 comprising two groups, a flying group and a technical group based at Laupheim Air Base. A third transport group of around 12 aircraft is sited at Holzdorf Air Base. The Luftwaffe currently has around 70 active CH-53s in total.

The German twin-engine CH-53s have been used across a range of missions from national requirements through to international operations conducted on behalf of NATO and the United Nations. These include Iraq, Kosovo with KFOR, with IFOR in Bosnia and Herzegovina, and more recently with ISAF in Afghanistan.

One of the questions concerning the decision of what to buy must focus on what the intended use of the new helicopter is likely to be in the future. Just how much heavy lift does the Bundeswehr require and how likely is it that it will be called to support NATO, UN or even European Union operations.

It has long been a fact that western European countries within NATO generally



Photo: Bundeswehr/Michael Mandt

**German CH-53G helicopter releasing a WIESEL tactical vehicle.**

ing of German military helicopters, including MRO. Its employees are also located at Bundeswehr bases around Germany to provide on-line maintenance support. This new contract could strengthen Airbus'

lack heavy lift, both rotary and fixed wing, so the Bundeswehr retaining its heavy lift capability would certainly be of value militarily and politically to the German government.

## Sikorsky CH-53K

While this seems to be the most straightforward acquisition, it is not that simple. The CH-53K KING STALLION is not yet in service with its main customer, the United States Marine Corps (USMC), although in April it was successfully passed by the Defense

While Lockheed Martin has been eager to underline the “three times” lift capacity of the CH-53K over the CH-53E, it is questionable whether the Bundeswehr needs a large fleet of 60 plus aircraft with this capability now. And being new it will have a relatively high unit cost compared to Boeing’s CH-47F, a factor that will only be

on when the German government wants deliveries to begin will guide how “low risk” the CH-53K is – and how much time the USMC will have had to iron-out the wrinkles associated with fielding any new aviation platform.

Boeing has actually been in “on-off” discussions regarding deeper cooperation with Airbus for some years, although there has never been any formal agreement announced between the two companies and main discussions over a joint heavy lift helicopter were dropped due to cost. Both Boeing and Sikorsky have also been talking to national and regional third party suppliers.

## Airbus – and the X6?

While Airbus does not currently have an helicopter to deliver a heavy cargo capability along the lines of either the CH-53K or the CH-47F, it has developed the X6 concept helicopter, potentially a design that followed on from its earlier discussions with the EDA and Boeing about concepts for a new heavy helicopter. However, Airbus is unlikely to advance that beyond concept without a clear indication that German and other European customers would financially back its development or guarantee orders.

In the short term, therefore, Airbus wants to be the prime supplier on any contract to secure the MRO of either of the existing types that the German government might buy. Both Lockheed Martin and Boeing are firmly against this as they would be surrendering a huge chunk of ongoing revenue derived from the through-life support, maintenance and upgrade of either platform. Sikorsky has not reaped big rewards while Airbus continues to maintain the existing German CH-53 fleet, something that it is keen to change due to the high cost of the development of the CH-53K. Both American organisations have been working hard to secure new and reconfirm existing third party supplier agreements.

While Airbus declares that the German aerospace sector needs to be supported by a decision in its favour, both Lockheed Martin and Boeing will work to prove that they too will allow this to happen if they win the contract.

One more imaginative view might be that the German government considers a smaller fleet of either the CH-53K or the CH-47F, particularly as the latest upgrades will take at least 26 of the current CH-53GS/GE fleet out to 2030, then look at encouraging Airbus to develop a heavy-medium platform to join the Luftwaffe as their replacements in the 2030s. ■

Photo: US Marines



**The US Army plans to have a pure fleet of 473 F-model CHINOOKs by 2018 and to field a new “Block 2” upgraded CHINOOK F by 2021.**

Acquisition Board (DAB), achieving a Milestone C decision that approves funding for low rate initial production (LRIP). The USMC expects its first units to announce Initial Operating Capability (IOC) during 2019.

On 5 July, Lockheed Martin announced that a CH-53K had just successfully completed its first extended cross country flight from Sikorsky’s West Palm Beach Development Centre in Florida to the Naval Air Station Patuxent River, in Maryland.

By then the four CH-53K Engineering Development Model (EDM) aircraft had completed over 450 hours of flight testing from West Palm Beach, including flights with internal and external loads. The flight test programme continues, conducted by an Integrated Test Team (ITT) comprising Sikorsky, US Navy Naval Air Systems Command (NAVAIR), and US Marine Corps (USMC) personnel.

This marks the transition between ground testing and initial flights to a more robust flight test programme which will largely be carried out at the flight test facilities at Patuxent River (PAX).

“This first movement of CH-53K flight testing to our customer’s facility denotes that the aircraft have achieved sufficient maturity to begin transitioning the focus of the test programme from envelope expansion to system qualification testing,” said Dr. Michael Torok, Sikorsky Vice President CH-53K Programs.

mitigated if a large number of helicopters is purchased.

In addition to Germany, Lockheed Martin is also targeting its CH-53K sales efforts towards existing CH-53 users Israel and Japan.

In 2016, Germany sent a Request for Proposal (RfP) to the US Government for around 41 aircraft in 2016 to request pricing and availability. Lockheed Martin would be interested in adding additional foreign orders into the Sikorsky production line, particularly if the finance generated would compensate for a slower than anticipated acquisition by the USMC.

## Boeing CH-47F

While Germany has never operated Boeing’s CH-47F CHINOOK, the fact that many of its allies including US Army Aviation, the Royal Air Force (RAF), the Royal Netherlands Air Force (RNLAf) and the Royal Canadian Air Force have already decided on the CH-47F may well be an influential factor.

In fact during a recent gathering of industry and politicians at the Bückeburg training airfield in Germany, where the RAF and American Army brought two of their latest CH-47s (an RAF Mk5 with added fuel tanks and a CH-47F), the Reuters news agency reported that “German defence officials have said they want a low-risk heavy-lift helicopter that already exists.” Depending



# Medium-Calibre Ammunition Developments

**Remigiusz Wilk**

**The rapid development of medium-calibre ammunition has been observed for more than 20 years. This includes both projectiles for 20–60mm automatic cannons, and lower velocity 20-40mm grenades launched from single-shot and automatic grenade launchers.**

The driving factors are the rapid development of ever smaller, more reliable and increasingly resilient electronics, introduction of insensitive explosives and new shell and liner technologies, as well as the requirements generated from the experiences of recent and anticipated conflicts. One of the most noticeable trends is the growing number of various calibre weapon systems for air burst munition (ABM). The shooter sets the projectile detonation point and the round detonates at a designated distance above the target, even behind cover. ABM constitutes a replacement to current high explosive and fragmentation projectiles.

## Air Burst

The development of Rheinmetall Defence's (former Oerlikon Contraves Pyrotec) AHEAD air burst programmable ammunition as one of the first and most successful variants began in 1988. The serial production started in 1996 with deliveries to the Canadian and other armed forces. AHEAD was initially designed as a close-range air defence system, primarily to defeat cruise missiles. Since then, it has been used in fire support and anti-armour roles with land based platforms, and to defeat small and fast naval targets from ships and boats. The Afghanistan and Iraq missions also spawned a requirement for an improved C-RAM (counter-rocket, artillery, and mortar) capability. Following a similar principle, Bofors developed the 3P and Orbital ATK the Mk 310 PABM-T rounds. To achieve the designated point of deto-

Photo: Rheinmetall



***To achieve improved efficiency, air burst ammunition with a programmed detonation time is gradually replacing older high-explosive and fragmentation projectiles.***

nation the weapon systems are equipped with a sophisticated battery-powered system including a day and night sight, a laser rangefinder, an atmospheric sensor, a digital inclinometer and compass, a ballistic computer and a fuse programming device. The fuse setter can be located at the muzzle brake, in the feeder or in the chamber; also, the round can be programmed in flight by infra-red or radio waves. The peripheral equipment increases the weapon system's cost and weight, not to mention energy consumption, which is an issue for the infantry weapons. However, the benefit is increased accuracy and lethality, as well as a significant reduction of the number of rounds needed to destroy the target. American soldiers using the 25mm experimental XM25 semi-automatic grenade launcher in Afghanistan praised the ABMs and called them "the game changer". In February 2017, CTAI (a Nexter Systems and BAE Systems joint venture) announced

that a 40mm Cased Telescoped Armament System (CTAS) ammunition was in full-scale production. The weapon system had been developed since 1994. It includes a telescopic round with a projectile completely enveloped by the propellant. The advantage is in reducing the ammunition's overall length. The CTAS ammunition family includes a general purpose round-airburst-tracer (GPR-AB-T, range 2,500 m) and in the future an anti-aerial airburst-tracer (A3B-T) will be introduced. It is the largest medium calibre weapon programme in Europe. In early 2017, the Russian company NPO Pribor confirmed that it was in the early stages of an ABM development for use with 30mm 2A42 and 2A72, and 57mm BM57 cannons. The 57mm x 348 round emerged in 2013 when Renault Trucks cooperated with Petrel company to jointly develop the ATOM 8x8 vehicle. The 57mm ammunition and UVZ AU-220M BAIKAL remote-controlled turret have been promoted since.

## Author

**Remigiusz Wilk** is a Poland-based defence journalist and the Polish correspondent of Jane's JDW/IDR/JIW/JMR.

Photo: Rheinmetall



**The 40mm x 53 DM131 ABM is being delivered to the Bundeswehr and was qualified by German (2014) and Dutch (2013) armed forces. The range is programmed via infrared interface.**

Photo: JSSAP-ARDEC



**The US Army has developed the 40mm SAGM air burst grenade with proximity fuse since 2012. It has been designed for in-service grenade launchers.**

In May 2017, Aselsan reported that the development and qualification of 35mm air burst ATOM ammunition was complete. The round is similar to that of AHEAD and is designed for use with KORKUT twin 35mm self-propelled anti-aircraft guns.

In October 2016, Poland started searching for a 30mm x 173 ABM for the wheeled ROSOMAK 8x8 and the future BORSUK tracked infantry fighting vehicles (IFVs). New ammunition is to be used in the ZSSW-30 remote-controlled turret (developed by Huta Stalowa Wola and WB Electronics) armed with ATK's 30mm Mk 44S cannon.

Photo: UralVagonZavod



**The Russian AU-220M BAIKAL unmanned turret armed with the 57mm BM57 automatic cannon. Russia is working on 30mm and 57mm air burst ammunition.**

Also, the 88 VILKAS (ARTEC Boxer 8x8) vehicles recently procured by Lithuania are to be capable of firing ATK's 30mm Mk 310 Mod 0 PABM-T. The vehicle is equipped with Rafael's ADS SAMSON Mk II unmanned turret armed with a BUSHMASTER II cannon. In February 2017, the US Army launched a tender for 30,000 Mk 310 PABM-T rounds for delivery in 2019. They are for use with the XM813 cannon (an ABM-capable variant of the Mk 44).

Older systems have recently been upgraded to fire ABMs with regard to increased lethality and combat effectiveness. One example is a contract for Nexter Systems to design a 25mm x 137 HEI-AB programmable round for the French VBCI 8x8 wheeled

IFV armed with a 25mm M811 cannon. The ammunition is based on CTAS. In Iraq and Afghanistan APACHE helicopter crews discovered that the 30mm x 113 M789 HEDP ammunition was ineffective against ground targets when hitting sandy surfaces. Therefore a proximity sensor fuse for the round was developed by ARDEC. It increases the lethality against soft targets and may be also be used to engage unmanned aerial vehicles and small boats.

## ABM Grenades

The ABM development started with air defence weapon systems, then evolved to the soldier level. The requirement for counter

Photo: Raytheon



**The 40mm semi-active laser-guided SPIKE ammunition from Raytheon is to increase single soldier lethality and the firing range to 2,000 m.**



Photo: Rheinmetall



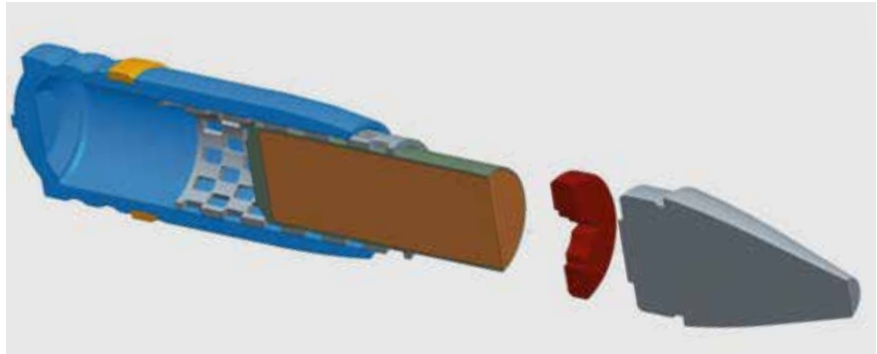
**The AHEAD projectile developed in the 1990s is currently used in 30mm x 173 calibre for the Rheinmetall MK 30-2/ABM cannon fitted to the PUMA infantry fighting vehicle.**

defilade projectiles came from in-theatre experience. Since the late 1990s, air burst technology has been introduced for 40mm



Photo: Orbital ATK

**The 30mm x 173 Mk 310 PABM-T ABM has been qualified for the Mk 44 BUSHMASTER/ XM813 automatic cannon used with the STRYKER DRAGOON. The ammunition has also been subject to a Belgian procurement effort to equip their PIRANHA IFVs.**



Drawing: PM-MAS

**Proposed 30mm x 113 anti-personnel ammunition for the APACHE M230 chain gun with an additional shear liner to enhance lethality by forming uniform fragments**

x 53 high velocity (HV, 240 m/s, range 2,200 m) ammunition, which was integrated with automatic grenade launchers (AGLs) for

use in the anti-personnel role. In the mid-2000s, the HV programmable grenades were matured and qualified. Currently in

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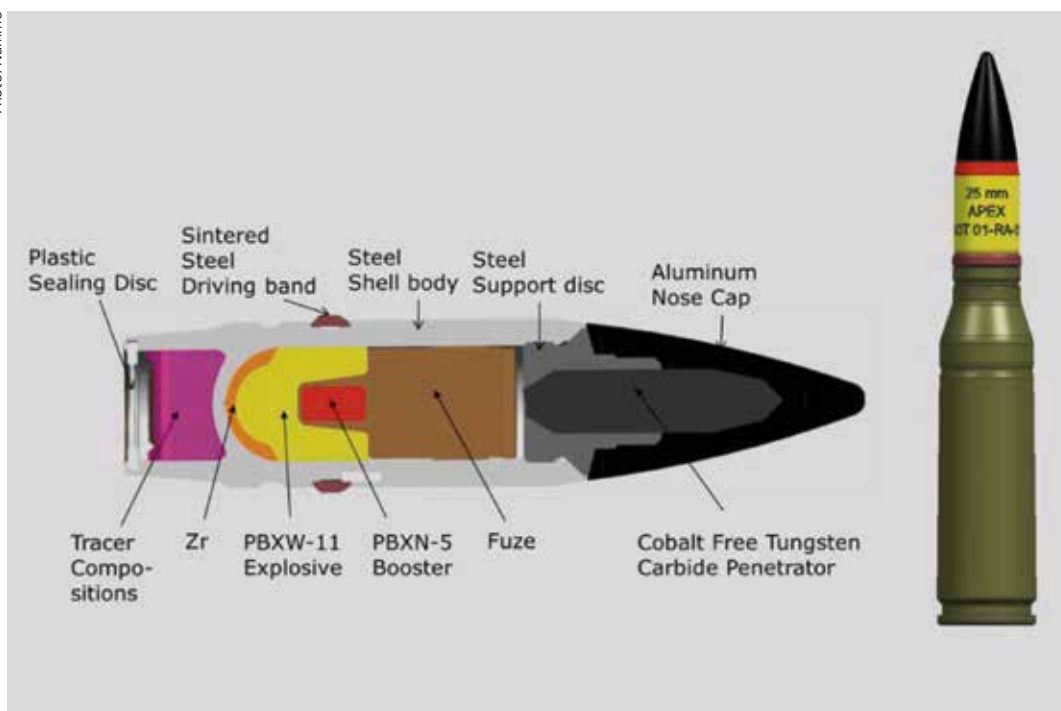
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Photo: Nammo



**The 25mm x 137 PGU-47/U APEX (Armour-Piercing Explosive) round developed by Nammo for all three variants of the F-35 Joint Strike Fighter**

The IRAP objective is the development of a 50-600 m range projectile to provide a small unit a higher first shot hit probability (reduction of range error by a half), coupled with the ability to defeat targets in defilade positions at increased ranges with greater accuracy and lethality, for example against body armour. The SAGM design is based on a philosophy different from earlier air burst rounds, and it is simpler to use. The grenade is not connected with any FCS, and does not require an additional power source or weapon accessories, nor is programming a requirement. It uses a miniaturised defilade

service are Rheinmetall's DM131 round (the Bundeswehr purchased a large quantity in 2015) for the H&K GMG AGL coupled with a VINGMATE fire control system (FCS), Nammo Mk 285 PPHE for the General Dynamics OTS Mk 47 STRIKER 40 AGL with Raytheon AN/PVG-1 LVS FCS, ST Kinetics AMBS for the STK 40 AGL Mk 2 AGL, and Nammo C171 PPHE-RF for the C16 CASW (GMG-E) AGL with VINGMATE FCS. The US Army plans to introduce the 40mm HV round for the Mk 19 Mod 3 AGL in a couple of years. The development of hybrid systems like the 20/5.56mm XM29 OICW grenade launcher-rifle and the 25mm XM25 CD-TE stand-alone semi-automatic grenade launcher, capable of firing a smaller calibre and higher velocity programmable ammunition, seems to have failed. Therefore, it seems that there will be more cost effective 40mm x 46 low velocity (LV, 78 m/s, range 400 m) and 40mm x 46/x 51 medium velocity (MV, 105 m/s, range 800 m) ABM. The ammunition has been developed by Rheinmetall Defence, IMI and ST Kinetics, among others. While the LV round is to be chambered in a single-shot stand-alone or add-on grenade launcher (GL), some of the MV rounds are designed to be used only in multi-shot revolver grenade launchers (MSGL). It is worth mentioning that programmable rounds are to be introduced for the Chi-

nese 35mm LG5 portable AGL, promoted as an anti-sniper weapon.

A poor man's equivalent of sophisticated ABM grenades without a fire control systems and a fuse setter are the 40mm x 46 LV and MV bouncing grenades, such as the Bulgarian Armaco AR466M2-MV. When the projectile hits the ground, it is kicked back 0.5-1.5 m into the air by a small charge and then detonates.

In the scope of the Increased Range Anti-Personnel (IRAP) programme, the US Army has developed an air burst grenade named Small Arms Grenade Munitions (SAGM) since 2012.



**A niche in the development of modern medium-calibre ammunition is being addressed by the supercavitating Mk 258 Mod 1 30mm round developed by Nammo or DSG Technology Cav-X models. It enables precision for target engagements in the air and in water, thus expanding the lethality of ship-based cannons.**

detection proximity sensor. The side-looking fuse with a 360-degree radio frequency pattern detects defensive structure close to its flight trajectory and detonates at 1m above the ground and 0.5m behind the target. One weakness of current prototypes is that the projectile is not able to distinguish between friendly or hostile units nor is there a selection mode for obstacles if there is more than one.

The proximity fuse and delay mode are also to be used in the Air Burst Non-Lethal Munition (ANLM). The flash-bang XM1112 LV round can be fired with standard 40mm GLs.

The next step in the development of this ammunition is marking and tagging rounds to maintain observation of military targets and following their moves.

## Door Breaching

The US Armed Forces are looking for a new generation door breaching cartridge. The requirements are based on combat experience, namely soldiers lacking the ability of rapidly breaching up to 50 m, without a pause between the actual single shot breach and entry of initial force. Rheinmetall ARGES has developed the two LV High-Explosive Blast Enhanced door breaching cartridges HEBE16-50/100. The grenade is equipped with a retractable spike to maximise the blast effect to breach doors with



minimal fragmentation and low collateral damage. HEBE16 grenades are charged with 51 g or 101 g explosives.

Nammo Talley has completed man rating of the Door Breaching Round (DBR) in April 2016. DBR is a low velocity (63 m/s) grenade with 50 m effective range, intended to breach doors without producing projectile fragments and with no significant rearward projecting fragmentation. The injection-moulded plastic projectile body is filled with 195 g IM PBX explosives. Chemring Ordnance has developed its Rapid Access Munition (RAM) which allows grenadiers to quickly gain access to the building or other urban structure. The US Navy was interested in purchasing 1,000 RAM rounds in September 2016.

### Anti-Drone

The emergence of a number of cheap and easy accessible unmanned aerial vehicles for surveillance and attack has spawned the development of UAV countermeasures. Among them is the 40mm non-lethal LV/MV ammunition fired from a GL/MSGL and equipped with a net warhead. It allows the use of existing weapons to launch a non-destructive projectile to neutralise and recover the hostile UAV. Also multi-segmented projectiles were designed, such as the SKYNET drone defence round offered by Amtech Less-Lethal Systems company. It resembles a bolas-type weapon made of projectile segments at the ends of interconnected strings, separated with centrifugal force, and creates a "capture net" to trap the drone's propellers, causing it to fail.

### Extended Range

The US Armed Forces have a requirement for an extended range medium-calibre guided weapon with a range of up to 1,000 m. In October 2015, Raytheon unveiled a miniature semi-active laser-guided precision ammunition "pike" developed in cooperation with Nammo Talley. It can be loaded in the 40mm LV single-shot GL allowing the use of very long ammunition (such as the side-open H&K M320 or FN Herstal Mk 13 Mod 0). The pike is fired like a standard grenade, but during flight is powered by its own rocket motor, thus achieving ranges in excess of 2,000 m. Usually one soldier uses a small laser designator pointing at a target, while another fires the

weapon. In an emergency it is possible to use the system alone, because for the first 15 seconds of flight no guidance is needed. The 770 g projectile is 425 mm long and equipped with a 270 g blast fragmentation warhead with a lethality radius of 10 metres.

### Other Developments

An interesting, less-lethal concept is the Adjustable Range Impact Munition (ARIM) developed by The Safariland Group. ARIM is a direct-fire blunt impact (also with irritant or marking payload) round, that can be adjusted according to short (0-40 m) and long (40-70 m) ranges.

The projectile incorporates a user-adjustable gas bleed feature to adjust velocity. The US Armed Forces are also looking for a 40mm LV Short-Range Anti-Personnel (SRAP) cartridge for close-quarter combat. The SRAP is to be designed to allow the engagement of enemy soldiers with high accuracy and enhanced lethal effects at a distance of 0 to 50 metres.

With the increasing number of thermal and night vision devices (IR and NV sights and goggles) modern armed forces are looking for day and night thermal training LV and HV cartridges. There is also constant development of environmentally friendly 40mm training grenades. ■

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# Glock Modular Handgun System

**Jan-Phillipp Weisswange**

Glock was one of two participants in the US Army's Modular Handgun System (MHS) solicitation to reach the Competitive Range. Contrary to many claims, the company from Deutsch-Wagram (near Vienna, Austria) did not come up with just an adaptation of a standard model, but with a specially developed system. ESD was able to take a look at the Glock-MHS on-site.

**G**lock began to develop its Modular Handgun System based on a request for proposal (RFP) of several hundred pages issued by the US Army, which specified pistol and ammunition require-

ment: a pistol with corresponding, effective ammunition and the following accessories; training kits for special training ammunition, and threaded barrels for silencer application.

calibre of the weapon. Also, applicants were allowed to submit several models for selection.

Glock therefore came up with two proposals: the Glock 19 MHS in calibre 9 x



**The Glock 19 MHS kit: pistol with inserted standard size magazine, two extended 19-round magazines and interchangeable back straps**

ments. The US Army needed not just a new service pistol, but a complete sys-

## Author

**Jan-P. Weisswange PhD** is communication manager in the defence industry. This article reflects his personal opinion.



Optical sights were not a requirement, but a manual safety was. In addition to improved ergonomics and high reliability, the US Army demanded primarily higher efficiency and accuracy for its future service pistol system. "In terms of accuracy the requirements asked for a Match Pistol," says Richard Flür, Director of International Sales with the Austrian arms manufacturer. The RFP did not specify the

19mm and the Glock 23 MHS in calibre .40. In addition, the company joined forces with the ammunition manufacturer Vista Outdoor for this project. The 9 x 19mm calibre Enhanced Barrier Round (EBR) ammunition type was developed specifically for this project. It is similar to the projectile of the M855A1 5.56 x 45mm Enhanced Performance Round, which has been introduced as new, standard ammunition of





**Ambidextrous concept:** The manual safety, the slide stop lever and the disassembly lever can be operated from both sides. The extended magazine release button can be deployed in an ambidextrous way.

	Glock 19 MHS	Glock 23 MHS
		
<b>Calibre</b>	9 x 19 mm	.40 S&W
<b>Functional principle</b>	Safe-Action-Trigger, firing pin safety, drop safety, additional manual safety	Safe-Action-Trigger, firing pin safety, drop safety, additional manual safety
<b>Magazine capacity</b>	17 and 19 rounds	15 and 22 rounds
<b>Trigger pull weight</b>	20 – 31 N	20 – 31 N
<b>Barrel length</b>	102 mm	102 mm
<b>Sizes (L/W/H with a magazine)</b>	185 mm x 34 mm x 138 mm	185 mm x 34 mm x 138 mm
<b>Weight (with an empty magazine)</b>	708 g	786 g

the US Army for the M4 carbine and the M16A4. However, according to Vista, there are major differences in design and technology. The self-financed development of the Glock MHS was remarkably fast, taking only 18 months.

### The Glock 19 MHS – a One-Gun Solution

Glock presented the Glock 19 MHS model to ESD during a company visit. On the surface, the weapon distinguishes itself from the usual models by its colour. Both the polymer frame and the very

durable coated slide are “Coyote”-coloured, which is good for camouflaging in almost all climatic regions.

Glock chose a one-gun solution for its MHS application: one pistol that fulfilled all the requirements of both the full-size and the compact pistol, which is logistically convenient and convincing. The designers left out the finger grooves on the frame, just like on the FBI version. Together with the interchangeable back straps (with a beavertail option), this will ensure better adaptability for different hand sizes and for a better grip, for example when using gloves.

The Glock 19 MHS also features the Rough Textured Frame Surface already introduced with the Glock Gen4. The Rough Texture Frame Surface makes the weapon pleasant and easy to grip.

A closer look at the frame reveals that the Glock 19 MHS has the compact length of the 19 Series, but the standard height of the 17 Series models.

This way, the weapon takes the larger 17-round magazine. In addition to a standard magazine, the Glock MHS kit also includes two extended 19-round magazines. All are Coyote coloured. Behind the magazine well is a lanyard clip. The Glock 19 MHS also features the newly developed Glock Marksman Barrel. It has a new, hexagonal running profile with a right-hand twist; the rifling length is 250mm.

### Ambidextrous Concept

Like the Gen4 model there is the extended magazine release button which can be deployed ambidextrously. A new feature is the ambidextrous slide stop lever which can now be operated from both sides and which can easily be reached with both, the strong and the weaker shooting hand. An ambidextrous manual safety is also a new feature. If the shooter pushes it downwards to the “F” position, it is ready to fire; if the shooter pushes it upwards to “S”, it blocks the trigger bar. Incorporation of the manual safety was a specific demand of the US Army. As a standard feature, the pistol has, of course, the Glock-typical Safe-Action-System and the three proven independent safeties: trigger safety, firing pin safety and drop safety.

### On the Shooting Range

The Glock 19 MHS is easy to grip. The author, with relatively large hands, immediately liked the combination of compact 19-length and full-size 17-height. The self-illuminating three-point sights allow for easy pickup of the target and fast aiming. The trigger breaks clear, and the trigger reset is very good.

When shooting with the special EBR cartridge, the stronger charge is immediately apparent, giving you a sense of using an effective and powerful combat gun system. Furthermore, recoil and impact can be managed easily. At a distance of seven metres, the impacts were – with few shooter-related outliers – hole in hole even in the case of faster series. Shooting from the shooting machine at a 25-metre range the Glock 19 MHS delivered groups within a three-centimetre diameter.



*The self-illuminating three-point sights allow easy targeting.*



*The 9 x 19mm Enhanced Barrier Round cartridge*

Experienced shooters consistently hit the Nine and the Ten in the German Shooting Confederation (DSB) Target.

### Outlook

Several hundred of the Glock 19 MHS have been produced in recent months. In view of this promising self-developed weapon system, and due to several inconsistencies in the US Army's selection process, Glock filed a protest against

the decision in the MHS award procedure (see interview), but even though the US Government Accountability Office (GAO) ultimately rejected the complaint, mainly on financial grounds on 5 June, the MHS project from Deutsch-Wagram is not in vain, as the company is planning to make a variation of its MHS pistol available for the commercial market. Future Glock products will also benefit from the company's experience in the MHS solicitation. ■



*Shooting with the Glock 19 MHS. Despite the stronger charge of the EBR cartridge, the recoil and impact can be managed easily.*



## A Further Insight:

### Interview with Dr. Stephan Dörler, Managing Director, and Richard Flür, Head of International Sales, Glock GmbH.

**ESD:** At the moment, there is lots of discussion about the US Army's Modular Handgun System bid, due to incomplete information. How do you feel about the decision?

**Flür:** Of course, we are not happy about it. We find it particularly unfortunate that the decision was made only on the basis of one part of the originally planned tests: it would have been possible to do all the tests for both pistols remaining in the competition with relatively little cost involved, and then decide which pistol best meets the requirements. In the first phase, the pistols were almost exclusively shot from a machine, and no tests were carried out concerning different environmental conditions.

**ESD:** Glock's protest against the decision of the US Army was rejected. Was the protest a mistake?

**Dörler:** It is true that the protest did not result in any change to the decision. But most points of our protest were confirmed. However, it was decided that the contracting authorities have huge discretion in technical evaluation, which goes so far that it was decided not to rate the test results for the compact pistol reliability function after doing the actual testing. Ultimately, price, only the seventh most important criterion according to the RFP, was the decisive factor. Here, our competitor apparently had the much cheaper offer.

**ESD:** Was the competing Sig Sauer offer really US\$100M lower than yours?

**Dörler:** The total price is comprised of a number of different factors, from the pistol to various kits, spare parts packages to ammunition. We made a big effort to submit an attractive price offer.

The detailed price structure of the Sig Sauer proposal is not known to us. There is, however, a statement from Major General Robert Scales Jr., in the course of a hearing at the US Senate Armed Service Committee that Sig had offered its pistols two thirds below wholesale price. This would be roughly US\$150 per pistol. If this is true, this would actually be an extremely low price for a pistol with night sights and a surface that is very difficult to produce.

I would be very interested to know whether the serial production pistols that will finally be delivered are identical to the test pistols submitted for the bid – but I assume that this information will not be released. As I stated, this surface treatment is a real challenge in mass production.

US\$150 per pistol would not be possible for us even for such a large customer. All customers are important to us; we try to treat them all equally.

**ESD:** Were life cycle costs taken into account during the bidding process, or were procurement costs alone the decisive factor?

**Flür:** We see this as a problem of most handgun tenders: life cycle costs are not really determined, which of course leads to a misrepresentation of the real costs. In most cases, only a defined quantity of pistols and spare parts are multiplied by the prices per piece, not taking into account what round-counts the pistols endure, or how many spare parts

are actually needed. It would be easy to determine this based on performed durability testing. This can even give products with high spare parts consumption an advantage, because the gun price can be subsidised through margins on the spare parts.

Also, logistics and personnel costs for repair and maintenance are rarely taken into account in the calculation of the total costs – although these are usually higher than the price of the actual pistol itself when looking at the whole life cycle.

**ESD:** Did the proposed MHS solutions also differ in terms of logistics?

**Flür:** Yes. While our competitor offered a solution with two pistol models (Full Size and Compact), we submitted a solution with only one gun (one-gun solution) that met all requirements regarding dimensions, magazine capacity and accuracy.

The indisputable logistical advantages of handling only one product, combined with the significantly smaller number of different spare parts, were not taken into account in the cost assessment.

**ESD:** Do you have any knowledge about the shooting performance of your products compared to the competing pistols?

**Dörler:** We do not know the results of the rejected competitor products. During the protest we received comparative data for the two competitors that advanced to the Competitive Range. In this regard, too, the protest was meaningful to us: it showed us that our engineers did a great job in developing a highly innovative pistol, in combination with the ammunition resulting in a highly innovative system that achieved the best results in reliability, precision and effectiveness.

Our ammunition partner, Vista Outdoor, also did an excellent job. In many situations the 9mm EBR cartridge is more effective than .45 calibre ammunition.

**ESD:** Will there be a version of the Glock Modular Handgun System pistol for the commercial market?

**Flür:** Yes. We think this is a great pistol and would like to give all interested parties the opportunity to try and purchase it.

<sup>13</sup> Under the factor 1 reliability evaluation, Sig Sauer's full-sized handgun had a higher stoppage rate than Glock's handgun, and there may have been other problems with the weapon's accuracy. AR, Tab 3, SSDD, at 12. Due to the Army's redactions of the agency report, the results of Sig Sauer's compact handgun test are unknown.

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B-414401

#### *Extract from the GAO decision of 5 June 2017*

All costs associated with the development of the pistol were financed by Glock, so it is also possible to market the pistol independently.

Of course, we will be able to make good use of the experience gained from completing this project. Some aspects will certainly be reflected in future Glock products.

**The interview was conducted by Waldemar Geiger on 1 August 2017.**

# New Vehicles for the Belgian Light Brigade

**Joris Verbeurgt**

On 30 June 2017, the Council of Ministers of the Belgian Government gave the green light for the tender calling for the acquisition of 199 Light Troop Transport Vehicles (LTTV) for the Light Brigade. First delivery of the vehicles is planned for 2019, the last batch is to be delivered by 2021.

## Commandos, Paratroopers and Special Forces

The Light Brigade – formerly known as the Regiment Para-Commando – consists of a headquarters in Marche-en-Famenne in the Belgian Ardennes, a commando battalion located in Flawinne, a paratroopers battalion in Tielen, the special forces group in Heverlee, a training facility for commandos in Marche-les-Dames and one for paratroopers in Schaffen. The light equipment and intensive training of the 2.000 staff brigade allows it to deploy at short notice, at home and worldwide. The light-infantry unit is trained in infantry techniques but can engage on land, at sea and in the air. Its origins go back to the Second World War

when Belgian volunteers escaped from occupied Europe to Britain and where they were trained as commandos to help with the liberation of Europe. Until today, traditions of British commandos and Special Air Service men are honoured by the Belgian paratroopers. The motto is “Nec jactantia, nec metu” (“no bragging, no fear”). Belgian paratroopers are highly respected elite-soldiers undergoing a severe selection process and a hard training programme. They are often deployed in theatres where conditions are tough and the environment hostile. In the 1960s and 70s (and later) they earned the reputation of being fierce fighters and professional soldiers during several military interventions in Belgium’s former colony Zaire (now the Democratic

Republic of Congo). Experienced in suppressing revolts and extracting and evacuating Belgian citizens at sudden outbursts of violence, Belgian paratroopers are highly regarded by friend and foe for their unique experience in dealing with specific Central-African problems.

The 2nd Battalion Commando and the 3rd Battalion Paratroopers (the 1st Battalion Paratroopers was dissolved in 2010) take part in peace keeping operations and in the defence of the Belgian territory. They are trained to combat terrorism, to support the nation in case of catastrophes and are integral parts of the EU Battle Group and the NATO Response Force. The Light Brigade plays an important role in NEO (Non-combattant Evacuation Operation)



*The Belgian Armed Forces operate a large fleet of UNIMOG type vehicles, part of which will become subject to replacement by the new Light Troop Transport Vehicle (LTTV).*



of European citizens and takes part in UN and NATO Operations. The two battalions support the Belgian Naval Component in anti-intrusion operations and deliver support to the Special Forces Group (SFG). The Belgian SFG consists of hyper-trained soldiers that can be deployed at any time for any type of operation. Observation and the gathering of information is the main task of an SF operator. But the FSG also takes care of the training of the security personnel of the Belgian embassies (DAS or Détachement d'Agents de Sécurité). The FSG disposes of teams for amphibious-, land- and air operations and the team members can specialise as paratrooper, sniper, combat diver or mountaineering expert. The motto of the Special Forces is "Far Ahead", which is no exaggeration.

## Modularity and Multi-Faceted Deployments

The LTTV will be one of the base vehicles of the special operations forces inventory. A high degree of modularity is required for the vehicles to function in a broad range of missions and in all sorts of terrain and climatic conditions. The acquisition of new LTTVs has been assigned high-priority since the current UNIMOG vehicles (produced by Mercedes) date back to the 1990's and are unarmoured/unprotected, which prevents their deployment in today's types of military operations in which mines, roadside bombs and all sorts of EOD's are the enemies' preferred weapon of choice. The €63.3 million order comprises 199 standard platforms and 175 mission modules to be installed on the standard platforms. Ballistic protection kits (42), mounted 12.7 (heavy) and 7.62 mm (light) machine-guns and 40 mm smoke pot launchers complete the order. A multi-year technical assistance agreement is also part of the deal. An ambulance version is planned for the future. In accordance with the ambition level of the Belgian Defence and in line with the Strategic Vision of the Belgian Government, the new LTTVs must allow the Light Brigade and the SFG to remain a high-readiness force able to deploy at short notice. The decision to buy new LTTVs also meets the demand of NATO for Belgium to strengthen its SO capacity. Since speed, autonomy and flexibility are key to the types of operations they will be involved, the LTTV must be transportable by air and by sea.

Two versions of the LTTV will be built, with each version corresponding to a mission module. For the A Special Operations version the mission module will be

## "Main characteristics of the LTTV are good strategic and tactical mobility."

### Interview with Lieutenant-Colonel Tom Bilo

From 2011 to 2014 LTC Tom Bilo was the commander of the Belgian Special Forces Group. He is currently the Deputy Director of the newly established Belgian Special Operations Command and in charge of the procurement effort for 199 Light Troop Transport Vehicles (LTTV) by the Belgian Defence Department.

**ESD:** Can you describe the role of the Special Forces Group (SFGp) within the Belgian Armed Forces?

**Bilo:** As a separately organised and specially equipped and trained unit that is directly commanded by the Chief of Defence but operationally subordinate to the Assistant Chief-of-Staff for Operations and Training the SFGp is prepared to deploy at very short notice to conduct the complete NATO and EU spectrum of special operations (special reconnaissance, direct action & military assistance). The SFGp also performs specific tasks as part of a national non-combatant evacuation operations and nationally-directed special operations on or outside the national territory, including strategic- and operational-level intelligence gathering in support of other Defence Staff departments, or other departments of the Federal Government.

**ESD:** What exactly is the requirement for the new LTTVs? What will they be used for?

**Bilo:** The LTTV will replace the Mercedes UNIMOG which has been in service since the early nineties in the SF Gp and all the Paracommando units and is currently reaching the end of its service life. Main characteristics of the LTTV are good strategic and tactical mobility, including airlift by C-130/A400M and, once in theatre, a good all terrain capacity. Another feature is active protection: to allow good observation, flexibility and adaptability in case of incidents and also a better interaction with the local populace outside the vehicle; therefore, the vehicle has a semi-open structure. The vehicle will be heavily armed, as SOF teams often work in completely autonomous small groups. Different mountings will be foreseen to equip the vehicle (front and backside) with machine guns up to calibre 12,7mm and 40mm automatic grenade launchers. This will be complemented by a series of 40mm smoke dischargers. For passive protection, all vehicles will have protection against mines. Depending on the mission, the vehicle will offer the possibility to be equipped with extra protection modules. Regarding the load capacity, the requirements for strategic and tactical mobility have to be taken into account, meaning that the vehicle will offer the necessary space and payload to provide 48 hours of autonomy to a paracommando squad and even more for an SF team with a different organisation.

**ESD:** Which roles must the new LTTV's be able to perform?

**Bilo:** As already suggested by the designation, the LTTV is a light troop transport vehicle. This is the primary role. The LTTV will also function as a logistic platform ("mother ship") when special operations forces conduct long-term operations in remote theatres of operation. Depending on the mission and the use by special forces or paracommandos the configurations will be slightly different. There will also be an ambulance version of the LTTV.

**ESD:** How will new LTTV's help the SFGp in future operations/to counter future threats?

**Bilo:** Together with the Rapid Reaction Vehicles (RRV), which will be delivered very soon, the LTTV will be the basic mobility platform of the paracommandos and special forces. Their special design features and characteristics will allow the SF group and the other units of the Special Operations Regiment to conduct a broad range of SOF missions, from military assistance and "assist and advice" types of operational engagements, through to non-combatant evacuation operations and full-blown direct action missions."

**ESD:** What is the single most important feature of the new LTTV?

**Bilo:** The most important feature is that the vehicle answers to the soldiers' and operators' needs in all environmental conditions. Hence, it is important that the vehicle offers a good balance in terms of strategic mobility, robustness, range, payload, protection, all-terrain mobility, speed, firepower and technical reliability.

**The interview was conducted by Joris Verbeurgt on 25 August 2017.**

open to guarantee the broadest possible observation- and firing sector, as well as the quickest reaction time in case of an incident. The Special Operations version will come in two types, namely 'Special Forces', offering space for four passengers (twenty-seven vehicles of this type will be purchased), and 'Paracommando (SOF capable), able to carry six persons. 140 vehicles of this type are required. The order will also comprise eight vehicles of an 'Ambulance' version. This mission module will be closed (type shelter) and will dispose of two seats and two lying boxes that can hold a stretcher.

### Technical Specifications, Armament and Passive Protection

According to the public tender document, the standard platforms must be equipped with corner fittings so that the modules can be attached by means of twistlocks. The LTTV must meet the specifications for the N2G category (transport of personnel and goods), with a maximum weight of between 3.5 and 12 tons. It must have specific technical characteristics for off-road use and have an optimal all terrain mobility. It must also be transportable by air with C-130 HERCULES and A400M, respectively the current and the future aircraft for tactical air transport in use by the Belgian Air Force. The loading capacity must be more than nine tons and less than twelve tons.

The armament of the LTTV will be as follows: a 12.7 mm M3M weapon system from FN Herstal or equivalent (159 pieces). 167 pieces of the 7.62 mm weapon system, already in use with the Belgian Army, will be furnished by the Belgian



Concept study of the future LTTV

Defence Department. Both automatic weapons systems will be equipped with a damped gun carriage recoil mechanism. 167 40 mm smoke pot launcher systems complement the armament of the LTTV. All standard platforms must be equipped with fixed anti-mine protection. 42 dismountable ballistic protection kits must protect the vehicles from direct and indirect fire. Finally, the public tender document prescribes that the provider of the LTTV must at least have one service point in Belgium for the procurement of spares and the maintenance and repair of the vehicles.

### The Way Ahead

The LTTV's will be a useful addition to the armoured rapid reaction vehicles that were ordered by the Belgian Government in 2015 and of which delivery will take

place in the course of this year. They will replace the unprotected ILTIS jeeps. The Belgian Minister of Defence Steven Vandeput made a point to the press that "This procurement is in correspondence with my strategic vision and must be seen in the context of strengthening the special operations forces-capacity of the Belgian Defence, as demanded by NATO". The purchase of new LTTV's is not the only measure taken by the Belgian Government to boost SOF capabilities. Not only will the SFG be equipped with the newest specialised material, the tasks of the commando battalion and of the para-battalion will be extended to encompass support to SF operations. National and international command- and control structures are developed and the acquirement of special SOF-airplanes is scheduled for the 2025-2027 timeframe.

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# Upgrading Legacy Soviet Tanks

David Saw

By the early years of the 1990s the European defence environment had changed dramatically, with German Reunification, the end of the Warsaw Pact, the collapse of the Soviet Union, the breakup of Yugoslavia and the Conventional Armed Forces in Europe (CFE) Treaty. In the 26 years since then, new countries have emerged and the facts on the ground in Eastern Europe are totally different. The only constant over these 27 years has been the presence of legacy Soviet military equipment.

Today the era of legacy Soviet equipment is coming to an end in many parts of Eastern Europe, for others though this equipment will continue to remain in service. Expanding the definition of Eastern Europe to include what might be described as the "Former Soviet Core" in the form of Russia and the Ukraine, with Belarus as a supporting player, provides us with a totally different set of experiences as regards legacy Soviet equipment and its future.

lic, Hungary and Poland joined NATO, followed in 2004 by Bulgaria, Estonia, Latvia, Lithuania, Romania, Slovakia and Slovenia. Then in 2009 came Albania and Croatia, with Montenegro being the most recent country to join.

In an ideal world, those nations that had joined NATO would have liked to equip themselves with NATO standard systems and retire their legacy Soviet systems. Even if this had been possible, there was never

to meet real operational needs. Hence the "Former Soviet Core" states would place real resources into upgrading their military capabilities, arguably far more so than the former Warsaw Pact states.

## Tank Upgrade Programmes

If there is one area of legacy Soviet equipment that has seen major upgrade activity it is that of armoured vehicles, particularly tanks. The T-72 tank entered service in the early 1970s and more than 25,000 have been manufactured, with the tank in service all over the world. The T-72M/M1 version of the tank (an export variant of the T-72A) was produced under licence in Czechoslovakia (ZTS Martin in today's Slovakia), Poland (Bumar Labedy) and provided the basis for the Romanian TR-125 tank and the M-84/M-84A tank produced in the former Yugoslavia (both Croatia and Serbia are working on M-84 upgrade programmes).

The largest single operator of T-72 tanks is Russia, having an estimated 9,000 tanks either in service or in storage. The baseline configuration for the Russian Army T-72 is the T-72B variant that became available in 1985 and offered improved firepower, protection and mobility over earlier models. Then came the T-72BM featuring the Kontakt 1 ERA system, in 1989 the T-72BM was fitted with the Kontakt 5 ERA system as well as improved standard armour. The 1990 T-72BM variant, with an improved fire control system, provided the basis for the T-72BU, which eventually emerged in 1993 as the T-90. It is expected that some 400 T-90A tanks in service with the Russian Army will be upgraded to the T-90M standard with improved firepower and protection characteristics.

Work continued on enhancing T-72BM performance, and in 2006 this led to the T-72BM ROGATKA. This variant has an improved gun and gunner's sight, enhanced engine and improved protection via the Re-



Photo: Author

**The latest upgrade of the T-72 to enter service with the Russian Army is the T-72B3. This brings the tank up to T-90 standards. A further upgrade with a new commander's panoramic sight is being worked on, and this will reportedly provide the basis for the next upgrade variant: the T-72B4.**

One of the most significant series of events in the evolution of the modern defence environment in Eastern Europe started at the end of the 1990s with the eastward expansion of the North Atlantic Treaty Organisation (NATO) alliance to welcome former Warsaw Pact members and newly emerging states. In 1999 the Czech Repub-

lic, Hungary and Poland joined NATO, followed in 2004 by Bulgaria, Estonia, Latvia, Lithuania, Romania, Slovakia and Slovenia. Then in 2009 came Albania and Croatia, with Montenegro being the most recent country to join. In an ideal world, those nations that had joined NATO would have liked to equip themselves with NATO standard systems and retire their legacy Soviet systems. Even if this had been possible, there was never



Photo: Author

**Ukrainian industry developed a number of T-72 upgrades, with Ethiopia being the customer for 171 upgraded T-72UA1 tanks between 2011 and 2013. These tanks have Nozh ERA, and a new engine, APU and cooling system. The Ukrainian Army has also received some 30 T-72UA1 tanks.**

likt 3rd generation ERA system. The next variant of the T-72 for the Russian Army was the T-72B3 that arrived in 2013, this features a high-performance FCS including a new ballistic computer. Initially, 150 T-72B3 tanks were acquired with first deliveries to the Russian Army in 2014. Belarus received an initial batch of four T-72B3 tanks from Uralvagonzavod in early July, with official statements noting the upgrade of Belarus Army T-72B tanks to the B3 configuration could be undertaken in Russia and at the same price that the Russian Army pays. An agreement has been reached on upgrading a further batch of Belarus T-72B to the T-72B3 configuration in Russia.

With more than 1,400 T-72 tanks (the majority being the T-72B), Belarus is obviously looking to upgrade its tank fleet. A domestic upgrade is the T-72BM1, which features the indigenous Peleng Sosna-U gunner's sight (as used in the Russian T-72B3), more recently Belarus Army Repair Plant 140 in Borisov has proposed the T-72BME upgrade, which focuses on upgrades to sights and electronics, as well as increased protection. It remains to be seen whether Belarus will look to meet the majority of its T-72B upgrade needs via the Russian T-72B3 upgrade or will look to emphasise domestic tank upgrade capabilities. Industry in Belarus has proposed a number of upgrade programmes for legacy Soviet armour, including such systems as the BTR-50 personnel carrier, BRDM-2 reconnaissance vehicle and the PT-76 light tank.

One of the most ambitious T-72 upgrade programmes took place in the Czech Republic in the form of the T-72M4 CZ. Originally, this would have seen over 300 tanks upgraded, but complexity and cost limited the number of upgraded tanks to a little more than 30 units. Another T-72 upgrade

effort was the T-72SIM-1 in Georgia. This saw the integration of Kontakt 5 ERA and a number components from the Polish PT-91 TVARDY programme including the FCS and sights.

At the end of the Soviet era, Poland was looking to acquire a new tanks, and there had been discussions with the Soviet Union over the acquisition of the T-80. The Soviet collapse put an end to the T-80 acquisition and instead Poland looked to develop a new tank based on the T-72M1 but incorporating a higher performance Polish-designed engine, the Drawa fire control system and an enhanced protection package developed in Poland, resulting in the PT-91 TVARDY. The Polish Army received the first new production PT-91 tanks in 1993, in parallel existing T-72M1 tanks were also upgraded to the PT-91 standard.

Today the Polish Army operates some 232 PT-91 TVARDY tanks, along with some 150 T-72M/M1 tanks, with 300 more T-72s in store. The PT-91/T-72 still provides a major proportion of the Polish tank fleet, but with significant growth in potential threat tanks, there is increasing interest in finding a replacement for existing tanks or looking to significantly upgrade them to cope with the escalating threat. One potential solution is to proceed with the PT-16 upgrade developed by Bumar Labedy and other parts of the Polish Armament Group (PGZ). The PT-16 upgrade is aimed at both the PT-91 and the T-72 and features a new 120mm NATO standard gun, sourced either from Slovakia

### Soviet Aircraft in the Polish Air Force

The Polish Air Force has operated both legacy Soviet equipment and more recently US-supplied equipment. In 1984 they received Sukhoi Su-22M4 and Su-22UM3K combat aircraft from the Soviet Union to provide an attack capability. These aircraft, although reduced in number to 12 Su-22M4s and 6 Su-22M3Ks, are still in service with the Polish Air Force. The Sukhoi is rugged and reliable, and has proven easy to maintain over its extended service life, the only upgrades being new communications and cockpit instrumentation.

Another Soviet-era survivor is the MiG-29/MiG-29UB fleet, these arrived in 1989 and still remain in service, although the numbers were sustained via the arrival of ex-Czech and ex-German aircraft. It took until August 2011 for the first significant contract to be awarded for the upgrade of the Polish MiG-29 fleet, with Military Aviation Works No.2 at Bydgoszcz being tasked with the upgrade of 13 MiG-29A and three MiG-29UB aircraft. The upgrade, carried out in association with IAI of Israel, included the installation of a MIL-STD-1553B databus, new mission computer, navigation system and a NATO standard communications system. Significantly, the upgrade did not include the installation of a NATO standard IFF system. Poland hopes to replace both the Sukhoi Su-22 and the MiG-29 by 2025 with a new combat aircraft type.

While they retained the Sukhoi Su-22 and the MiG-29 in service, Poland retired its MiG-23 fleet in the 1990s, with the MiG-21 fleet going in the early 2000s. Between 2006 and 2008, Poland took delivery of 48 Lockheed Martin F-16C/D Block 52+ aircraft under the Peace Sky programme. The cost and the complexity of the F-16 acquisition soaked up much of the Polish Air Force budget, meaning that it was necessary to continue to operate the Su-22 and the MiG-29 as they offered an affordable and supportable operational capability, with spares easy to acquire from the Ukraine.



or the Ukraine, increased protection, a new powerplant and improved suspension.

## Ukrainian Upgrades

As the Ukraine emerged from the wreckage of the Soviet Union, it found itself with a significant defence industrial base, including the Kharkiv Morozov Machine Building Design Bureau (KMDB), one of the most important armoured vehicle design and manufacturing complexes in the former Soviet Union. Along with this came the sub-contractor base with certain limitations, for example initially there was no tank gun production capability in the Ukraine. There were also important military-run facilities as well, including a major tank repair and overhaul facility in Kyiv and the central BMP rebuild facility in the Soviet Union, which was located at Zhytomyr. The Zhytomyr facility still repairs the BMP, but its remit is now far wider and it works three shifts a day repairing all types of armoured vehicles for the Ukrainian military.

The Ukraine also found itself with vast quantities of military equipment, far more than it could support and more than it could ever envisage needing at that time. There were thousands of armoured vehicles including T-80UD, T-72 and T-64 tanks. Over time the Ukraine would sell on a lot of this surplus equipment, with Ukrainian industry often becoming involved to refurbish said equipment prior to delivery. For example, one major contract was the sale of 320 T-80UD tanks to Pakistan with deliveries from 1997 to 2002.

The Soviet T-80 programme was originally not allocated to KMDB in the Ukraine. The need to produce a diesel powered variant of the tank (T-80UD) in place of the gas turbine powered standard T-80 saw production start in the Ukraine. Although KMDB was a production site for the T-80, the need to prepare T-80UD tanks for export exposed the lack of industrial capability in certain key areas, for example, as previously mentioned, tank guns. This stimulated efforts to fill these capability gaps and make certain that the Ukraine had a full armoured vehicle industrial base.

Towards the end of the 1990s an improvement in the financial circumstances in the Ukraine and the realisation of a need to support the defence industrial base, allowed progress on a development of the T-80UD known locally as the T-84. This led to the development of the more advanced OPLOT variant, some 10 of which were acquired by the Ukraine for trials. If required, the standard T-80UD can be upgraded to the OPLOT configuration. A more ad-

vanced variant of the OPLOT, known as the OPLOT-M, has been developed, while an export variant of the system has been sold to Thailand. The Ukraine is due to receive 10 new OPLOT-M tanks in 2018.

The Ukraine has developed a number of upgrade proposals for T-72 tanks, including the T-72UA1 upgrade. Ethiopia received 171 T-72UA1 tanks with deliveries in 2011/2013, with the tanks having a new engine, APU and cooling system, plus Nozh ERA. A small number of Ukrainian Army T-72 tanks have reportedly been upgraded to this standard in response to the conflict in the Donbass that started in March 2014,

known as Object 434 was under development, this vehicle was equipped with a 125 mm smoothbore gun, improved sights and armour and many other modifications, this was later classified as the T-64A.

The T-64A was further modified through the 1970s, at the same time work was proceeding on a further evolution of the design under the Object 447 designator, this had an improved gun and engine and other modifications and entered production in 1975 as the T-64B. Further modifications were introduced for both the T-64A and T-64B across the 1980s, with production of the tank finishing in 1987.



Photo: Ukrainian Ministry of Defence

***The presence of the KMDB tank design and manufacturing complex in the Ukraine has allowed the Ukraine to sustain its tank fleet and develop upgrades such as the T-64BM BULAT. KMDB will supply the OPLOT-M, its latest generation tank, to the Ukrainian Army in 2018.***

although the Ukraine has placed most of its T-72 fleet in store, favouring the T-64 as its standard tank. More recently on 14 July 2017, Ukrainian President Petro Poroshenko announced during a visit to the Lviv Armour Vehicle Factory (LAVF) that the Ukrainian military would receive 72 upgraded T-72 tanks this year. The LAVF offers upgrade and modernisation packages for T-72B and T-72B1 tanks.

KMDB started work on the T-64 tank in the 1950s, but advances in technology and the threat forced a rethink and led to the Object 432 design that entered production in 1963 and officially entered service with the Soviet Army in 1966. This tank was equipped with a 115 mm smoothbore gun, and it is believed that some 600 of this version of the tank were built. While this was happening, a further evolution of the tank

After the fall of the Soviet Union, the majority of T-64 tanks ended up with Russia and the Ukraine, with Russia gradually withdrawing the tanks from service in favour of the T-72, T-80 and later the T-90. For the Ukraine they had in excess of 2,000 tanks initially, and as KMDB manufactured the vehicle it was decided that these would form the bulk of their tank force. As Ukraine had very little money to spend on defence, the active T-64 fleet was reduced to some 600 tanks, a substantial number were put into storage and other tanks were broken up for spares or scrapped.

KMDB then developed an upgrade programme for the T-64 known as the T-64BM BULAT, this is described as a "deep modernisation" and the objective is to bring performance up to the level of the Ukrainian T-84. The BULAT has

new add-on armour, accommodates the Refleks 9K120 or the Ukrainian KOMBAT gun-launched anti-tank missiles, can use newly developed Ukrainian APFSDS rounds, has a new fire control system and sights (including a thermal sight) and a new engine. By 2009 a total of 86 tanks had been upgraded to the BULAT configuration, currently the Ukraine has more than 100 of these tanks in service. Further T-64 upgrades continue to be investigated.

## Conclusion

In the final analysis, the era of widespread use of Soviet legacy equipment in the majority of Eastern European nations that have joined NATO is coming to an end. Fundamentally this is due to the fact that much of this equipment has reached or is reaching the end of its useful life. Added to which, today's mission profiles for Eastern European militaries are very different to what they were in the Warsaw Pact era and therefore require different types of equipment. That is not to say that Soviet era equipment will disappear completely, for some operators it still offers unique capabilities, for example in areas like assault bridging. Even so, it would be fair to say that for the majority of militaries in Eastern Europe



Photo: Ukspelexport

**The Ukrainian Army participated in the Strong Europe Tank Challenge (SETC) event hosted by US Army Europe and the German Army in May 2017, sending along an upgraded T-64BM BULAT to participate. The T-64 tank forms the largest proportion of the Ukrainian tank fleet.**

it is the beginning of the end for Soviet legacy systems. Move further east and the situation is very different, here legacy Soviet equipment both upgraded and new production is fundamental to current military capabilities. The latest Russian T-72 upgrade, the T-72B3, is a very capable tank and can compete with current NATO peer tanks and the expected future T-72B4 upgrade will be even more competitive. If Russia wants a large tank force, the only affordable way to achieve it is through a limited quantity of state-of-the-art T-14 ARMATA tanks being

backed up by large numbers of upgraded T-72 and T-90 tanks. As far as the Ukraine is concerned there is little doubt that they would like to reinvigorate their tank force through the large-scale acquisition of KMDB OPLOT-M tanks and move to develop their own next generation tank. Realistically this is not going to happen any time soon, as a result the only solution to preserve the strength and capability of the armoured force is to upgrade T-64 and T-80 series tanks. For the Ukraine, upgrading Soviet era equipment is not a choice, it is essential.

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# Comprehensive Force Protection Concept for Armoured Combat Vehicles

## A Holistic View

**Rolf Hilmes**

**Beyond doubt, protection and survivability constitute, in addition to firepower and mobility, the most important criteria for armoured combat vehicles.**

Interestingly enough, protection has noticeably become more relevant to the design of main battle tanks in Germany over the past 50 years. While the battle weight of the LEOPARD 1 main battle tank (MBT) was just less than 40 tonnes at the time of its introduction in 1965, the current LEOPARD 2 A7 version comes at almost 64 tonnes – that means a weight increase of 60 per cent in that period.

The survivability of armoured vehicles in the 60s was largely based on the following measures:

- Camouflage paint, camouflage net, smoke grenade dischargers,
- armour, CBRN protection (incomplete) and fire safety (incomplete).

Yet in the 70s, military conflicts and operations research studies revealed that such protective measures were far from guaranteeing adequate survivability for crew and equipment. A closer inspection of the

courses of action in battle clarified the following action chain:

- What is on the battlefield will be reconnoitred
- What has been reconnoitred is taken under fire
- What has been taken under fire is hit
- What has been hit is penetrated
- What has been penetrated is destroyed.

Based on these findings, Germany developed a “Comprehensive Force Protection Concept” for the design of armoured combat vehicles.

### Comprehensive Force Protection Concept

The Comprehensive Force Protection Concept comprises a holistic approach to, and a combination of, indirect and direct protective measures. Indirect protective measures are supposed primarily

to prevent/hamper the acquisition/detection of a target and secondly to avoid a direct hit, while direct protective measures shall take effect when the vehicle is hit, mainly by preventing/impeding the penetration of rounds. In a next step, conceptual measures were developed to minimise the vulnerability of the weapon platform and to prevent the total loss of crew and equipment.

### Indirect Protective Measures

#### Avoiding Detection

Since their first appearance on the battlefields, tanks have been camouflaged to avoid their detection. Camouflage means making vehicles to the best possible extent indistinguishable from the surrounding terrain features. While it used to be sufficient in the past to concentrate only on the visible surroundings, the introduc-



(Pictures: Author)

*Well-camouflaged combat vehicles in defence positions are hardly visible to the eye.*

tion of, among others, smart anti-armour systems nowadays requires a closer look at the entire electromagnetic spectrum under camouflage aspects:



**The conspicuous IR signature of a front-engined IFV (here: WARRIOR) would also pose camouflage problems in defensive positions.**

- Camouflage measures in the visible range
- Camouflage in the infrared (IR) range
- Camouflage in the radar range
- Acoustic camouflage measures
- Magnetic camouflage measures and
- Seismic camouflage measures.

Yet the possible camouflage measures among this group greatly differ in their practical efficiency. While, in general, statically deployed vehicles – e.g. in defence positions – may elude reconnaissance relatively well, moving targets on the battlefield cannot do so anymore (their movement signature alone will unmask them). That is why a unit prepared to conduct defensive actions definitely has the inside track at the outset of a battle.

Measures to minimise the IR and radar signatures are today indispensable for reducing the lock-on or release distances, respectively, of smart artillery munition and fire-and-forget missiles. However, state-of-the-art thermal imaging systems (3rd generation) have meanwhile become so efficient that the detection of armoured vehicles can only be avoided in well-established defence positions. Yet even there a front-driven tracked vehicle lacking any IR camouflage measures around the engine compartment would encounter problems. Camouflage measures in the acoustic, magnetic, and seismic ranges would, of course, be more than desirable considering the state-of-the-art fuze technologies used in some mine types, but, understandably, such measures cannot be put into practice. A 60-tonne vehicle will always keep emitting distinct signatures in the mentioned ranges. Some Russian MBTs carry the

electromagnetic EMT-7 countermine system mounted on their upper front plate whose integrated coil windings generate an artificial magnetic field that is supposed

to trigger magneto-ignited mines. Experts nevertheless challenge the effectiveness of this measure as the structure and strength of such an artificial magnetic field differ significantly from the magnetic field naturally surrounding a vehicle.

#### Avoiding Hits

In principle, vehicular movement profiles may circumvent possible hits. Owing to the performance of advanced fire control systems, however, a (constantly) high vehicle speed no longer guarantees escaping a hit. Accounting for combat range and type of ammunition and by tracking the target with the aiming line of the sighting device a few seconds prior to firing, the current fire control systems cal-

culate the required lead angle irrespective of the speed rate of their targets.

A vehicle may only avoid a hit effectively by continuously changing its lateral acceleration, because in this case even the most sophisticated fire control systems are incapable of determining an accurate prediction. This fact gave rise to the development of the twin-gunned turretless casemate design concept in Germany in the early 70s. Vehicles of that design were to engage the enemy on the move while their movement profile resembled the course of a wedding skier. For all that, the attempt to avoid hits through high mobility counteracts the principle of non-detectability and makes it more difficult for the crew to accomplish their tactical mission.

Laying a smoke screen into the line of sight/aiming line between target and enemy gunner would be another option for avoiding a hit on one's own vehicle. To be effective against gunfire, this measure would have to be taken prior to firing – in addition, the vehicle would have to move at least by half its length right after discharging the smoke grenades.

A smoke screen is still more promising in the case of guided missiles because they approach their targets with only low velocity (< 300 m/sec). Ideal for this case would be the operation of a UV sensor – in addition to a laser warning sensor – which automatically recognises the exhaust plume emission spectrum of a guided missile and immediately triggers countermeasures.

Among these countermeasures could be the immediate creation of a smoke screen obstructing the enemy operator's line of sight to the target. A faster countermeasure than a smoke screen, for use against an incoming SACLOS-guided missile, for example, would



**Reactive armour (ERA) on a Russian BMP-3 IFV (project for the United Arab Emirates). Thin basic armour requires a much greater amount of appliqué reactive armour.**



be an infrared jammer that misinforms the goniometer in the enemy missile launcher about the position of the target, causing the missile to crash on the ground.

The combination of the described sensors and effectors represents – in addition to the system computer – the core element of state-of-the-art active soft-kill systems, among them e.g. MUSS (Germany) and SHTORA-1 (Russia). Today, the created

## Direct Protective Measures

### Avoiding Penetration

The classical method to avoid penetration after a hit consists in the conversion of kinetic energy into deformation work and heat – as happens when the round penetrates through an armour plate. The traditional contest between “sword” (weapon effect) and “shield” (armour) brought

LENGER 2 TES H), thereby getting again close to the battle weights of the heaviest tanks of World War II (Tiger II (KÖNIGSTIGER): 69.8 t, Tiger Ausf. B tank destroyer (JAGDTIGER): 75.2 t, A39 TORTOISE: 79.2 t). The high battle weight of modern MBTs may not hide the fact that their strongest armour is limited to their front surface +/- 30 degrees – referring to the dimensions of the crew compartment – all other surfaces (incl. the roof) are considerably less protected. Although much more efficient engines and transmission and track designs are presently available compared to the heavy armoured vehicles of World War II, the classical problems during operations (transportability, usage of infrastructure, high logistic expenditure etc.) still persist.

The invention and introduction of reactive armour in the early 80s improved to some degree the protection against the threat arising from shaped charge jets, but the effectiveness of these armour elements strongly depends on their mounting angle and the round's point of impact so that reactive armour can only provide, in connection with side effects, a statistical protective cover ratio of not more than approx. 50 to 60 per cent. Moreover, reactive armour elements cannot be applied to all surfaces of the vehicle. The weight and volume (and amount of explosives) of appliqué reactive armour elements on surfaces with low basic armour would have to be greatly increased – while concurrently the reactive forces to the basic structure would have to be limited. The same implications occur also with armour elements intended to defend KE penetrators, not forgetting the collateral damage caused by exploding reactive armour elements to the vehicle itself and nearby friendly troops on the battlefield.



***Destruction of an approaching MILAN missile by a directed energy beam from the AMAP-ADS active protection system.***

smoke screen should obstruct the enemy's sight in both the visible light and infrared ranges and contain aerosol particles to disrupt laser illumination beams to the targets. The advantage of a UV sensor is that it detects any type of guided missiles – irrespective of the underlying guidance system (SACLOS, laser beam-riding or radar-guided) – while the laser warning sensor of the Russian SHTORA-1 system disregards incoming SACLOS guided missiles.

Obviously enough, active soft-kill systems can only counter the threat arising from guided missiles. The response times of the protective systems are counted in milliseconds – yet this is sufficient because of the low missile velocity. Moreover, owing to their long duration of flight, guided missiles need a clear view of target and can safely be controlled only after they have reached a specific minimum distance from their launchers. That is why soft-kill systems and guided missiles play only a minor role in urban warfare.

Reportedly, dummy tanks in World War II helped to avoid hits on own vehicles with great success, but now they would hardly be of use considering the characteristics of modern battles. Present dummies would need to emit both an optical signature and corresponding signatures in the IR and radar ranges.

about a considerable increase in vehicle weights over the past 100 years.

The area density in the front part of modern MBTs reaches as much as about 3.5 tonnes per metre squared despite the introduction of special armour with particular disruptive effects (primarily against the jets of shaped charges). Accordingly, present MBTs feature battle weights of, for example 71.5 tonnes (MERKAVA Mk. IV) or 74.95 tonnes (CHAL-



***The packing density of Russian MBTs enables the design of smaller and lighter vehicles, but almost every hit causes a total kill.***

The search for alternative protection technologies is therefore easy to understand. Some hope for the future has been seen in reactive hard-kill protection systems (TROPHY, IRON FIST, AMAP-ADS, AWISS, ARENA-E, and so on) that detect an incoming threat (e.g. via radar) and trigger appropriate computer-controlled effectors (blast effects, fragmentation/blast grenades). Hard-kill systems are equally effective against guided missiles and rocket-propelled grenades. They are supposed to cause damage in advance to, or destroy, the attacker. Defending against incoming

excellent results in that respect – all the more as additional criteria for the ergonomic design of the operator work areas were taken into account. Yet a tight packing density increases the number of vulnerable points in the vehicle, as almost every penetrating round could hit critical elements in the crew compartment (crew, fuel, ammunition). Previous lessons learned by the Russians in battle have shown that such hits very frequently resulted in a total kill of their MBTs. Even Western state-of-the-art combat vehicles have so far seen inadequate meas-

- Crew (three-man-crew, accommodated in a separate armoured compact crew compartment)
- Ammunition (in connection with an autoloader)
- Fuel and
- Engine.

All compartments will be isolated from each other. The ammunition and fuel compartments have to be provided with effective “blow-off-panels”. The technical implementation of these requirements will result in combat vehicles with a centre-mounted main gun in an unmanned upper carriage. The crew will be accommodated in a well-protected compact compartment in the hull (chassis).

Since the early 60s, many Western nations have investigated overhead mounted concepts which ensure – within a given weight limit – maximum survivability for the crew but suffer – like any other tank concept – from a number of drawbacks, such as:

- Problems in implementing a practicable optical system concept to provide the crew with the appropriate all-round vision and the required situational awareness
- Implementation of a high-quality image display for vision and sight systems (resolution, transparency, colour quality etc.)
- Implementation of a practicable emergency mode concept for the functions of aiming – laying – loading – firing
- Avoidance of a high firepower kill probability in case of hits into the relatively exposed main gun

In the 60s and 70s, Western nations addressed the aforementioned problems (by way of concept studies, construction of demonstrators, operations research studies, and so on) and eventually departed from the series production and introduction of centre-mounted gun designs. Yet the significant increase in the extent and quality of the expected threats in future conflicts has meanwhile given rise to a change of thinking. The first results of this reorientation are the new Russian T-14 ARMATA MBT and the German PUMA Infantry Fighting Vehicle – both vehicles are equipped with an external mounted gun in an unmanned upper compartment

## Conclusion

This article has shown that the measures applied to armoured combat vehicles in the 60s and 70s to ensure a sufficient probability of survival for crew and equipment had become inadequate. This fact led to a holistic approach to the investiga-



**Water jackets to store propellant charges in a CHALLENGER 1 MBT – a contribution to reducing vulnerability.**

KE penetrators that approach with an energy of approx. 10 MJ, a weight of approx. 6 kg and 4.5 times the speed of sound, is extremely demanding. The system has to react within microseconds (one millionth of a second), and the robust structure of the penetrator requires a corresponding counterforce of the effector. Accordingly, hard-kill systems may provide additional protection against guided missiles and rocket-propelled grenades – possibly also in urban scenarios. However, the systems do not provide any (additional) protection against blast threats (mines, IEDs) or explosively formed penetrators (EFPs) so that parts of the vehicle will still require massive basic armour.

## Reducing Vulnerability/Avoiding Total Kill

In the past, armoured combat vehicles were designed with an eye to tight packing density to minimise the protected volume. Russian design engineers achieved

ures to reduce their vulnerability under fire effectively.

Some progress was achieved by, for instance:

- Storing propellant charges in so-called “water jackets” (CHALLENGER)
- Storing part of the ammunition away from the crew in a separate compartment surrounded by “blow-off-panels” (M 1; LEOPARD 2)
- Using electric systems rather than hydraulic assemblies
- Installing self-sealing rubber fuel tanks, and
- Installing quick-acting fire and explosion suppression systems.

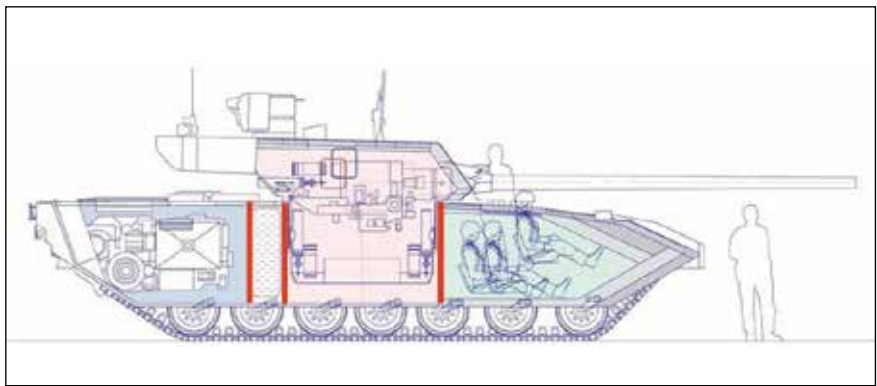
Considering the extent and the high efficiency of threats in current conflicts, the aforementioned measures will continue to fail in ensuring a sufficient probability of survival in battle. The decisive step should be made towards “compartmentalisation” – the clean-cut allocation of the useful compartments in a future combat vehicle to:





**Separate ammunition compartment for ready-to-fire rounds in a LEOPARD 2 MBT.**

tion into armoured platform protection in the 70s, which eventually produced the "Comprehensive Force Protection Concept for Armoured Combat Vehicles". Reasons for that approach were inter alia the advent of smart and terminally guided ammunition, fire-and-forget missiles and the increasing use of thermal imaging systems and mines with advanced ignition systems. The improvement of the protection against these threats required a more



**This cross-section through a Russian T-14 MBT illustrates the principle of "compartmentalisation".**

detailed consideration of indirect protective measures. The Comprehensive Force Protection Concept is subject to progressive development.

On the one hand, selection and design, respectively, of protective measures have to find their bearings by current and future-oriented threat scenarios. On the other hand, the technological progress mainly in the areas of electronics and data processing enables the design of novel protection systems – such as active active protection systems (ADS). Despite all advancements in smart protection systems, a solid basic protection (armour) will always have to

be retained in order to ensure a sufficient chance of survival for future combat vehicles because "smart" systems are not capable of building up an adequate protection capability against "silly" threats (e.g. blast and explosively formed penetrator IEDs and KE rounds).

The weight increase of future armoured vehicles may therefore be slowed down but not stopped. In addition, new protection concepts for threats to be expected in the future (such as laser weapons, raids by drone swarms etc.) ought to be taken into consideration and developed already today. ■

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# DSEI Preview – New Technology Poised to Enter Maritime Domain

**Stefan Nitschke**

**Data provided by manufacturers make it possible to characterise major maritime defence equipment trends at DSEI 2017.**

Photo: AEUK



In 2013, European Union (EU) member states shipped some €25.98Bn worth of defence items over European borders, or 70.8% of the total European arms exports, according to the EU's 16th Annual Report on Arms Exports. Some of the lead importers were key allies or trading partners, a trend that continues until today. The Middle East is the main non-EU destination of EU arms exports, totalling €7.7Bn in 2013 and €8.22Bn in 2015, according to varying sources. The facts show that naval technology was behind only land systems and aerospace defence products.

Against the background of a changing security environment, naval technology is going to address new applications like cyber, with noteworthy results. Industry notes that naval ships can be equipped with a variety of subsystems with heterogeneous security levels (e.g. navigation, propulsion, power supply, battle management systems, communications); but, there also is a strong need to train ship crews more consistently. These measures can significantly reduce the threats that still emerge within own ranks. Cyber training accounts for a significant chunk of the vibrant military training and simulation market.

Another crucial part of the equation, simulation and training is experiencing extraordinary achievements. "In this new age of digitisation, it is even more [important] to train surface and submarine crews to perform in asymmetric threat scenarios that are becoming to dominate the naval battlespace," an industry source suggested to ESD. According to Rheinmetall Electronics,

naval training is going 'high-tech' in response to longer deployments and budgetary restraints. Reduced manning levels on modern surface warships mean individual crew members have multiple roles and tasks. Consequently, additional training slots are required. Training capabilities must therefore be fully independent of the ship and other training hardware, further boosting shore-based training as provided by the company's Command Team Trainers. These are embedded simulators that run on the ship's installed equipment to provide realistic training for the bridge watch team in all aspects of navigation, seamanship, and ship handling.

There is also a trend in maritime forces choosing unconventional hullforms like SWATH (Small Waterplane Area Twin Hull) or 'eco-friendly' engines and 'greener' alternative fuels for surface platforms. MTU Friedrichshafen's expertise in the field of 'green ship' technologies goes beyond this with their most recent 'Green Fleet' programmes, with the aim to replace 50% of fossil fuels with synthesised bio-components. Alternative fuels with less fossil fuel content (target 50/50 blend) are well under way, but long-term experience is still to be gathered.

The SWATH technology innovated by Abeking & Rasmussen (A&R) in Germany is more expensive than other existing technologies, but as it gives the necessary stability with a smaller hull length, the cost of building such a ship is comparable to the cost of building a catamaran and more economical than ordering a single-hull ship. SWATH platforms can remain

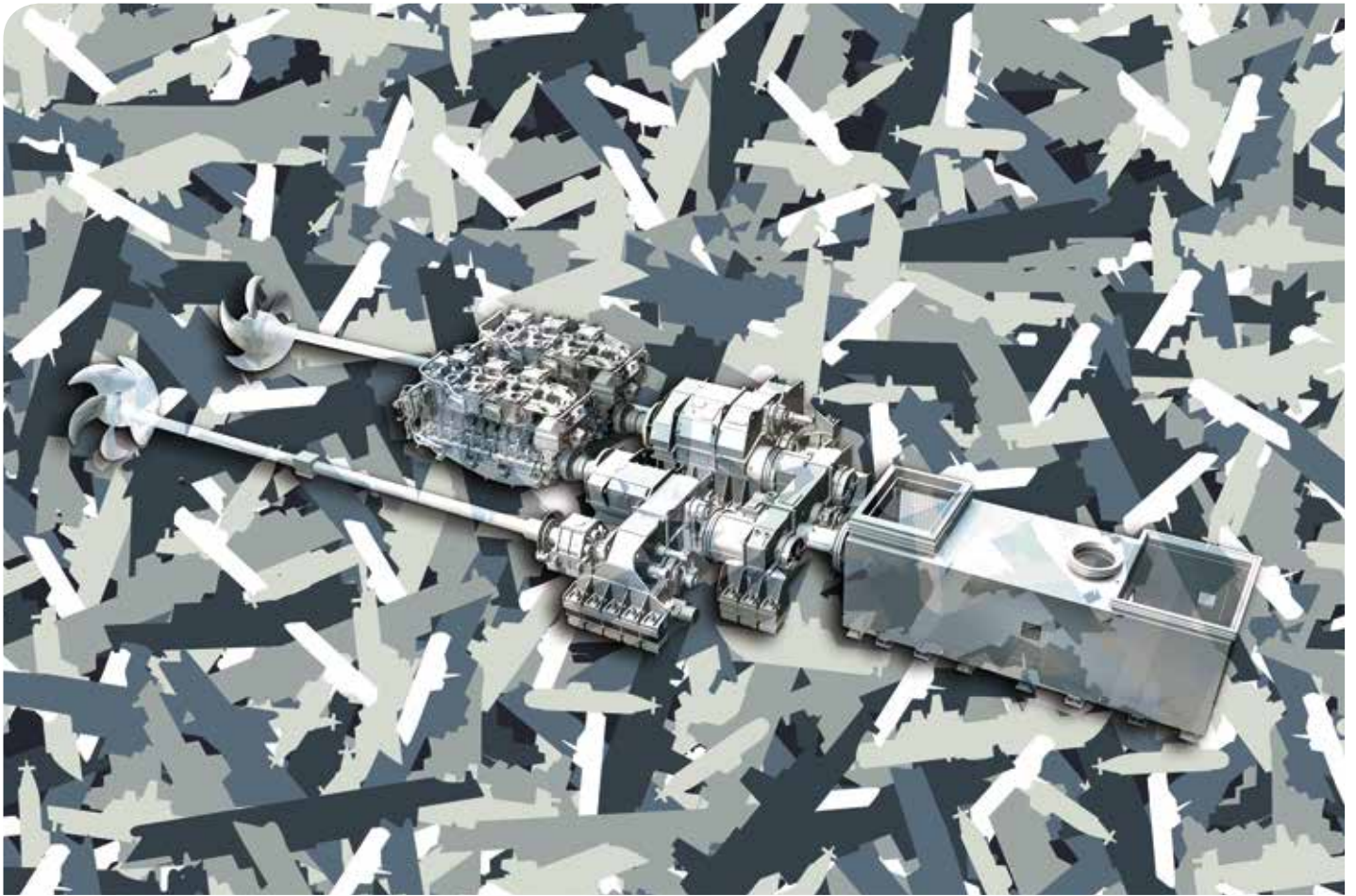
within the "comfort zone" much longer, since ship stability benefits enormously from the catamaran-type hull concept, thereby increasing the crew's capabilities, according to Thomas Haake, A&R's Head of Naval Projects, at the DWT Marineform in Linstow, Germany, last year. "We have to take into consideration – more than in the past – conventional hullforms [monohull], meaning not to focus on SWATH trimarans only; but, to also focus on completely new propulsion technology."

A&R's newest concept is called SWASH (Small Waterplane Area Single Hull). It is a stabilised single hull vessel whose displacement is in its central hull tube.

"Industry has done a tremendous amount of work in these fields and has achieved a lot," a key shipbuilding representative told ESD last July. Contrary to this, industry sources have been less effusive, complaining that, "a number of deals have been slow to be green-lighted," while some potential deals find it difficult to gain government backing. A striking example is Germany's reluctance over the acquisition of a shipboard drone, equipping Type K130 corvettes as a long-standing requirement. Despite the availability of a number of proven systems on the market, the German Navy Command and Parliamentary circles certainly do have a different view on the issue.

As to the modernisation of Europe's current inventories of Maritime Patrol Aircraft (MPA), defence ministers of a number of NATO member states recently agreed in a Letter of Intent (LoI) to initiate evaluations of successors for in-service MPAs,



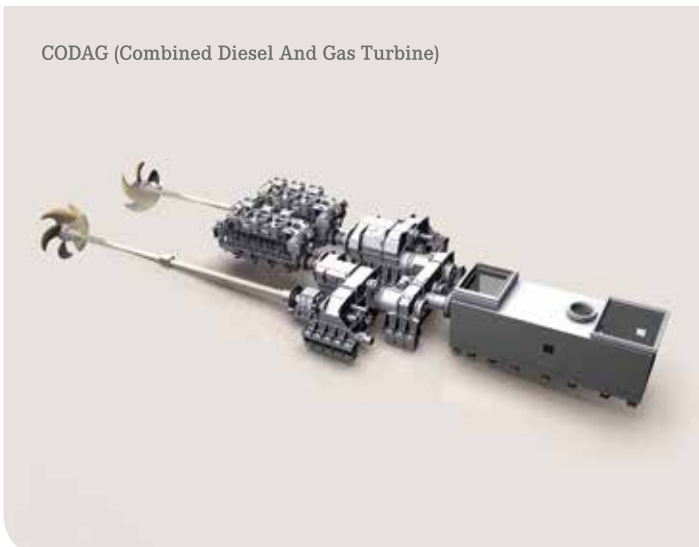


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predominantly BREGUET ATLANTIQUES and P-3C ORIONS. Here too, manufacturers do have mission-proven platforms on offer. This figure includes Saab, which developed a new generation of its ERIEYE airborne surveillance radar and integrated it on the Bombardier GLOBAL 6000 ultra-long-range aircraft. In combination with a new command and control (C2) system, maritime surveillance radar, electronic warfare (EW) devices, and tactical data-links, this platform is now available to customers as the GLOBALEYE.

## Veritable Engineering Marvels

As in previous years, DSEI 2017 is going to attract international navies to showcase some of their surface assets in the Naval Zone, with the dockside outside of ExCeL hosting up to eight warships – destroyers, frigates, corvettes, Offshore Patrol Vessels (OPVs) and mine countermeasures vessels – plus a number of rotary-wing aircraft. The programme will also feature dynamic demonstrations daily, displaying

benefit from completely new propulsion concepts. Data show that for the surface ship sector, combined propulsion systems like CODELAG (Combined Diesel Electric And Gas turbine), RENK's newly developed low-noise AED (Advanced Electric Drive) module or electric propulsion concepts are about to have significant effects on naval ship design at a world scale. Naval shipbuilders like BAE Systems Marine, CMM Group, Damen Group, Fincantieri, Fr. Lürssen Werft, Naval Group (formerly DCNS), and thyssenkrupp Marine Systems noted that this major trend cannot be ignored.

When looking at DSEI this year, it is pretty much understood that new propulsion technologies are becoming the new norm. In fact, a look at the latest shipbuilding programmes indicates that next-generation warships will be fitted with more advanced combined propulsors like CODOG (Combined Diesel Or Gas turbine) or CODAG (Combined Diesel And Gas turbine), resulting in less 'thirsty' engines and lower exhaust emissions. The Royal Navy started this revolution with its TYPE 45 destroyers kitted out with an all-electric propulsion

ESD was told in July that DSEI will recognise the "growing demand for integrated navigation systems [aboard naval ships]." With the SYNOPSIS Tactical Command System (SYNTACS), Raytheon Anschütz was the first naval system integrator to offer such an integrated navigation and C2 system. "Smart network architecture and innovative system modules not only dramatically reduce complexity, but also improve bridge system integration," said Marketing Manager Martin Richter. "This way, ship owners receive their 'entrance ticket' to Navigation 4.0."

Naval use of unmanned systems also matters. "We're moving UAV [unmanned aerial vehicle] technology from information-sharing to precision strike," said Peter Austermann, President of Global Business Development (GBD) headquartered in Niceville, Florida. There is a number of UAVs available on the market, both rotary-wing and fixed-wing types, which can be operated from small-deck ships, a capability that makes critical information available to multiple users and levels of command, and can predict the impact of sudden de-

Photos: René Lipmann; GreenSea Systems Inc.



**The STIDD DPD is the most widely used military-grade underwater mobility platform available on the market, seen here employed by the Netherlands Maritime Special Operations Forces (NLMARSOF).**



**The openSea software suite provides a previously unavailable autopilot feature, increasing DPD location accuracy and control.**

the remarkable capability of specialised boats and unmanned systems, together with associated equipment. This all indicates that this year's DSEI will function as the 'test bench' for new, innovative marine technology, an industry source quoted earlier this summer. Ship propulsion is just one item that intends to change the view of naval operations. Bernhard Vollmer, Head of Sales at RENK AG, suggested to ESD on 18 May that the naval sector might

system. "Platforms with new propulsion concepts, in conjunction with a higher level of ship automation [fewer personnel], will be the norm," said Kai Glasebach, Sales Director Navy & Governmental, at Schottel GmbH. "Industry shall examine completely new technologies for high-tech platforms like the OPV [Offshore Patrol Vessel]. Our customer nations in [the] Asia-Pacific [region] have first outlined this demand," he noted.

velopments on naval operations. He also points to small attack UAVs like AeroVironment's SWITCHBLADE that comprises a Non-Line-of-Sight (NLOS) precision strike solution with minimal collateral effects. This particular solution has been evaluated by the US Marine Corps.

An issue is the increasing use of unmanned surface vehicles (USVs). Different missions require different USV performance characteristics, with smaller, but modular pay-



loads plus intelligent software tools playing a decisive role. A system in this category is the ARCIMS (ATLAS Remote Combined Influence Minesweeping System) from ATLAS Elektronik UK (AEUK) that can be deployed as a reconfigurable system with modular payloads for mine countermeasures, hydrography, coastal ASW (Anti-Submarine Warfare), maritime security, and force protection. As read by AEUK's fact sheet, ARCIMS functions as a "toolbox of capabilities for multi-influence minesweeping, minehunting, and other operations." This new capability was demonstrated at UNMANNED WARRIOR 2016 (UMW16) in Scottish waters last October.

Operators of unmanned underwater vehicles (UUVs) have the choice of using better software components for command, control, and navigation. STIDD Systems Inc. fitted its new Recon Navigation System 2 (RNAV2) to the Diver Propulsion Device (DPD). It is both modular and multirole in character, with the capability of either 'clipping' into the DPD control console, or for use in handheld mode. RNAV2 is powered by powerful navigation control software from Vermont, USA-based GreenSea Systems Inc. This combination represents a breakthrough in control and navigation previously

Photo: Raytheon Anschutz GmbH



***SYNTACS is an extension of the Command Bridge concept, integrating a versatile C<sup>2</sup> solution with the capabilities of the IMO-certified Synopsis integrated navigation system to add enhanced situational awareness and a tactical common operating picture to the bridge system.***

unachievable with existing technology. All these technology 'triumphs' are ahead of more traditional systems as used for

ASW or Anti-Surface Warfare (ASuW); however, even the need for massive rejuvenation of legacy systems or entire



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Photos: Thales UK, SN



**The AW101 MERLIN ASaC helicopter (left) replaces the ageing SEA KING Mk7 ASaC helicopter equipped with earlier variants of the SEARCHWATER and CERBERUS systems. The right-hand image shows the Thales SEARCHWATER workstations.**

domains like ASuW is not unheard of in the naval community. As a consequence, there are currently plenty of programmes that call for better weapons and associated sensors. The 'first wave' of weapons includes small-calibre, rapid-fire cannons and fully integrated, remote weapon stations (RWS), functioning as 'last ditch' defence weapon systems that can help improve ship survivability under all circumstances. A number of competitors were emerging onto this market segment: Aselsan (SMASH; STAMP); FN Herstal (Sea deFNder RWS); Kongsberg Defence Systems (Sea PROTECTOR); Leonardo (HITROLE family); MSI-Defence Systems (SIGMA); Nexter Systems (NARWHAL); Rafael (Mini TYPHOON); Raytheon (PHALANX); Rheinmetall Defence (MILLENNIUM; SEARANGE); Saab (TRACKFIRE); and SAGEM (SEA WASP). An independent survey of naval RWS has revealed that both modularity and agility of such weapons may represent key criteria in the process of selecting the appropriate weapon.

Large-calibre naval guns are the other side of the medal. Two manufacturers, BAE Systems and Leonardo, are still dominating this market segment.

At the 'higher end' of the performance spectrum are laser-based weapons. "We are not seeing widespread demand for [shipboard] lasers, even high-energy lasers (HEL) for short-range air defence," naval strategists said; but, laser-based weapons could be able to complement or replace existing Close-in-Weapon Systems (CIWS) on-board a smaller number of future warship classes. Their adoption will be somewhat sporadic. "In some cases, like the US Navy, it will go quick, and in other cases, the navies won't adapt that quickly."

Rheinmetall Defence's or MBDA's HELs can be employed to counter saturation attacks by supersonic, sea-skimming anti-ship missiles. A little bit more complicated is the railgun technology currently being eyed by a handful of navies, including those of Germany, France, and the US.

### Backfit is in Demand

Retrofitting existing platforms – aircraft, surface ships, submarines – with newer equipment is a major issue at DSEI this year. Sonar technology is one example. Representatives of Wärtsilä ELAC Nautik GmbH underlined that the company's SCOUT mine/obstacle avoidance sonar can be installed on-board existing submarines as some sort of a backfit.

A major UK programme, the CROWSNEST project aims to migrate the SEARCHWATER SAR/GMTI (synthetic aperture radar/ground moving target indicator) radar and its associated mission system from the current SEA KING platform onto the Leonardo EH101 MERLIN rotary-wing aircraft. As told, all the Royal Navy's 30 MERLIN HM.2 helicopters will receive 'fit-to-receive' modifications to enable the rapid installation of the CROWSNEST mission package. The new capability will enter operational service in 2018 when the last of the SEA KING Mk7 ASaC (Airborne Surveillance & Control) helicopters are retired.

Revisiting naval aviation, in-service MPAs can be retrofitted with new on-board sensors and processing means. General Dynamics Canada developed the VENOM airborne acoustic processing system that was launched in 2013. It leverages commercial-level advances in hardware and the latest innovations in signal process-

ing technologies to maximise the detection of submerged threats in deep and coastal waters. The manufacturer stated that VENOM, "reduces operator workload and alleviates size, weight, and power concerns in the cramped cabins of modern military aircraft."

### Conclusion

Against the background of cyber as a battlespace domain, traditional warfare areas – ASuW, ASW and AAW – remain high represented on the floor at DSEI. But there are some major changes on the brink. Russia's demonstration of military power in the Baltic region, its increasing hybrid warfare abilities, continuing war within Syria, and the threat of terrorist activities have shown Europe's military capabilities are not where they want to be with respect to: long-range precision fires; sea-based and airborne EW; defence against cruise missiles and unmanned aircraft; and cyber protection.

It is feared that some defence equipment acquisitions will not deliver the capabilities naval forces need fast enough to tackle rapidly emerging threats, also in the underwater domain. As heard at many exhibition stands at the last edition of DSEI in September 2015, navies "must act immediately," to receive and adapt new technology solutions from the commercial sector. This is not an easy task in times of shrinking budgets; but, flexibility is key and naval services must come up with innovative procurement procedures. In this environment, sharing responsibilities with allies is more important than ever. 'Partnership' will thus be one of the buzzwords at this year's DSEI. ■



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# “DSO is the front end, talking to customers.”



Photo: DSO

## Interview with Stephen Phipson Head of DSO in the UK

**Stephen Phipson is the Head of the Defence and Security Organisation (DSO) within the Department for International Trade (DIT). DSO is responsible for ensuring outstanding support to UK defence and security businesses seeking to export and develop joint ventures and partnerships overseas; and to overseas defence and security businesses seeking to invest in the UK.**

**ESD:** Could you please comment on the status both commercially and technologically on the UK's SMEs?

**Phipson:** Well, the SME community in our defence sector is the bedrock of what we do, where most of the innovation takes place. We have a little more than 10,000 SMEs in the defence supply chain in the UK, and the MoD has a target to reach 20% of procurement directly through SMEs. Last year Michael Fallon launched the Defence and Security Accelerator which aims at encouraging more and more innovation from our SME community, and we work very closely to support that community. It is quite hard in large defence contracts overseas for SMEs to compete and directly export themselves, and with government contracts you tend to be asked for bid bonds and performance bonds and so on that make it difficult for small companies. We make sure they are teamed up appropriately and DSO are working hard to introduce SMEs to the right primes who can take on those prime contracts and making sure we have the latest innovations as part of our toolbox.

A recent quite important development is we are increasingly seeing SMEs from other non-defence-related sectors coming in with great solutions. In the automotive sector, for example, commercial answers can be highly relevant to defence, and there are new ways of thinking about advanced technologies in other sectors that we can use more effectively in defence.

It is getting a lot of cross-government interest, and we are starting to see good example of that actually working. Using automation technology in new ships, for example, is a new way of thinking. Also in the medical industry; they solved a specific problem that we also had in defence and we were able to move that technology from one sector to another.

There is a lot of encouragement and support in government for SMEs. The Department for International Trade through its General Export Support campaign – a great campaign – has been able to provide lots of advice, and we have a small business unit in DSO that supports directly as many as SMEs as we can. We work with the rest of the community, trade bodies like ADS and others to reach out to as many companies as possible, much of that support means introducing them to the right primes.

**ESD:** National technological ingenuity and creativity seem to an extent to have been masked by a failure or lack of interest in getting to market, especially with very small companies. Do you offer broader, underlying marketing support to such companies?

**Phipson:** Two things are designed to address this. First is the Defence and Security Accelerator, a GB£850M over the term of the parliament, reaching out to as many innovative companies as possible, challenging them and enabling them to come back, on a funded basis, with ideas. It's a very important new step: a

completely new process the government just introduced, primarily aimed at those SMEs. The process includes identifying them, assisting them financially and making sure we are aware of them, so we can proactively help with marketing, exporting and everything else. Second is the real determination in Defence Procurement to get to the 20% figure I mentioned earlier. For many very small companies the MoD is a daunting bureaucratic prospect, so part of the process is to make that simpler and more straightforward. MOD has made a lot of progress and is proud to be reaching the target – and they are reaching out to more and more SMEs on a direct basis. We have a role to play in terms of match-making, making sure we have the right SMEs with programmes and primes. For exports, more and more consortia are forming with lots of SMEs in them, which is really good to see, but it is not just about contractors doing it themselves: getting the best possible innovation into a solution which has MOD approval, helping those SMEs meet the right people – that's part of our role.

**ESD:** From a slightly bigger perspective: how does the UK's security policy impact the country's defence and security industry?

**Phipson:** We are more and more “joined up” on the security side. Recent events have led to a really close community working across government with all the agencies involved to create a coherent



UK approach – and I would contend that we are probably one of the most joined-up governments in the world in this respect. We are regularly asked for advice by other countries which is an important starting point in terms of our policy. Regarding exports, Security is one of our growing sectors, doing very well with about a 10% increase at slightly over GB£4Bn per year.

Other countries particularly value our expertise in integrating security systems: we are very good at that. Many border protection schemes bought and funded by national governments were traditionally run by armed forces with lots of personnel, but now with technological solutions – ground-based radar systems, surveillance systems, space-based systems – UK integration expertise is in high demand: it's a key strength.

The other is innovation. Security is probably one of the areas of highest innovation. We are without doubt the world leader in aviation security – we provide a substantial part of US aviation security, and at Heathrow, one of our premier airports, you will see some of the latest security systems, with complete situational awareness: we are very, very good at that.

We learned a lot from the 2012 Olympics, which were probably a pivotal moment in having a coherent approach across all of government, and as a result lots of systems and processes are working better. Many countries have come to ask how to implement them themselves, and thinking about major games – the Qatar World Cup, the Tokyo Olympic Games, the Panamanian games – they all present opportunities for our companies.

Our real differentiator is providing an integrated security solution, whether in aviation, borders, major games or any other large activities. Our networked police capability is considered to be the best in the world, building on how we run our operation centres and join together many systems to give the police a complete integrated picture: this is the thing that really makes us stand out against competition.

For Defence our most important alliance is NATO. Sir Michael Fallon (Secretary of State for Defence) speaks about NATO and interoperability all the time; our focus goes to NATO. And a lot of the integration technologies we use in the security sector are defence technologies. A word I like to use with the CEOs of the large defence companies is "convergence". We are going through a process of convergence between the security and the

defence sectors, and lessons we have learned and capabilities we have developed in the Defence sector are being applied more broadly into the Security sector.

**ESD:** With due regard for the hypothetical nature of the question, what is the likely impact of Brexit on the UK's defence companies?

**Phipson:** Of course, it is very difficult to say what is going to happen at the end of the process. We don't know. But if we look at Europe as a defence market for the UK, it is important, but relatively small – about 7% of our exports. It is our focus on NATO that is important, and some European countries have the same, so we work together at the NATO Alliance level which I think goes beyond trade negotiations on Brexit. We are firmly of the belief that this survives the Brexit discussions. One result so far is that we many other countries come to us wanting to be close partners, so we have a kind of "boost" of countries looking to form closer defence links because they see an opportunity to benefit from any separation. All of that is on the positive side, where we see the effects of the current negotiations with the EU. Of course there are risks for the Carriers and so on if we don't form the right trade agreements, but we can't comment on that because we don't know the answers.

Also, in Europe is that we have some very strong co-development programmes that have been going on for many years. If you look at Eurofighter, for example, that is not going to end in two years' time: it's a very strong alliance between countries under separate treaty. Look at missile production – complex weapons, MBDA, other arrangements between countries across Europe – we absolutely believe those things will go from strength to strength, not go

in the other direction. In the MOD we've got the most open and transparent procurement activity in the world and as a result of that lots of companies are attracted to come in.

**ESD:** The UK's and therefore, DSO's optimum relationship with foreign defence manufacturers going ahead: what will that be?

**Phipson:** I think we are going away from the traditional approach of developing a capability and then highlighting where we want to cooperate militarily with another nation and then trying to stimulate interoperability by selling the same capability to them. Now we see trends of countries developing their indigenous defence manufacturing capability. Consider Turkey, Korea, Japan, the UAE. This might seem to be a threat but it is actually a good opportunity. An example is the Turkish fighter development programme, TFX. We are saying to those countries: we will help you to develop your indigenous industry and platforms, using British technology, in a world where we can transfer intellectual property under controlled conditions; and we encourage joint ventures and the use of the UK supply chain, together in partnership. We can be talking about bil-

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Image: TAI

**DSO supports a number of countries to develop their indigenous industry and platforms, using British technology. An example is the Turkish fighter development programme, TFX.**

lions of Pounds of value, and we're also developing latest-generation technology which will take us forward too. That is the future rather than trying to sell something we developed ourselves. There are many examples, such as the ship campaigns in Canada and Australia, so it's a growing trend. The winners will be people offering support to build up indigenous capabilities: "Make in India" is all about future contracts that will be part of the largest defence acquisition programmes over the next 10 years, and we will be able to set up and partner with Indian companies and provide technology and jobs locally, and also use our expertise and supply chain to fill any gaps. Strategies built around that are a really significant trend and I think that is the future. Countries unable or unwilling will lose out, so we think taking a forward position, with all the right controls around it, is how to win in the end and keep the number 2 exporting position.

**ESD:** Please tell us your view of the Defence Growth Partnership program?

**Phipson:** This is really positive! As a government agency our export opportunity horizon is about five years. We measure ourselves and we plan based on opportunities that we identify in core markets, working on a 5 year rolling cycle. We work closely with overseas governments, and we are converting over 50% of the net funds we've identified so it's a really good, solid process. But the 5 year timeline means it works with things we have

already developed or that we can modify very quickly, in really close partnership with the MoD.

The DGP is about getting a longer-term view in terms of these opportunities; which small number of countries can we focus on to be able to develop a long-term capability partnership? Our defence industry, working as a team instead of as competitors, together with the UK government, can say to a country: "Can we help you to develop your next generation capability?" It's a really strong proposition. The structure of DGP is two parts: the Defence Solutions Centre in Farnborough, where industry gets together for initial market research: which countries will have what challenges over the next 15 years? How does that match up with our capabilities in the UK? What long-term opportunity can we get? Then there is the DSO part, which comprises building a team from industry that looks at the 5 to 15 year period to identify which issues might come from the 36 core countries: Which 3 or 4 do we want to concentrate on to do co-development going forward? Which partners and allies that we currently trade with would be willing, and would really want, the UK to work with them on long-term capability development? What I and the ministers like about it is that we have CEOs of industry around the table preparing and working together. Normally that is quite a challenging environment: they are not all best friends at all times!

Some great market research has come out of it and we're developing some really interesting strategies for individual countries. Our overseas partners like the concept because they're seeing the best 90% of UK industry: the DGP includes not only the major companies but also the SMEs and the trade associations. It is a really good way forward, and a pretty good thing. DSO is the front end, talking to customers. We did it with TFX, but now the question is: Can we do it with other countries?

**ESD:** Training and simulation must surely be one of the growth areas the DSO would want to be involved in. Any comment on that?

**Phipson:** Absolutely! – More and more of what we are doing with overseas countries is about setting up their own facilities: I see a very good market for fast jet trainers, in terms of actually setting up pilot training facilities. We are pretty good at training military officers, and we often find our best partners have been trained at Sandhurst or RCDS. "Defence" is pretty flat with small growth, depending on the year, but training is growing quite substantially – and simulation in particular. In terms of exhibitions the issue always is limited resources: we always have to make choices about where we go. If I had more money I would do training in a heartbeat.

**The interview was conducted by Stephen Barnard.**



# CROWSNEST

## The Strike Carrier's Eye in the Sky

**CROWSNEST is the name for the project to provide a new airborne early warning system for the Royal Navy. SEA KING Mk 7 helicopters operated by 849 Naval Air Squadron currently operate in this role and provide what is now called Airborne Surveillance and Control (ASaC). They are the last SEA KING remaining active in UK service but are due to retire in 2018, by which time this type will have served for nearly 50 years.**

### The Common Sense Solution

CROWSNEST will not involve the purchase of any new aircraft. Instead, the RN will receive 10 equipment kits for fitting to some of its 30 MERLIN HM2s. The GBP269M contract for these kits was finally placed in January 2017 (including GBP£9M worth of spares). Development of the system has been underway for some time and flying trials have started. The project will provide work for more than 200 people in the UK; Lockheed Martin (Havant), Thales (Crawley) and Leonardo Helicopters (Yeovil).

Image: Thales



**Computer-generated image of a MERLIN Mk2 with the CROWSNEST surveillance system fitted to the side of the helicopter**

The CROWSNEST system is an evolution of the well-proven CERBERUS tactical sensor suite and the SEARCHWATER 2000 radar that currently equips the SEA KING Mk7s. The radar is mounted in an inflatable bag on the port side of the helicopter and can be raised by rotating through 90° for landing. The CROWSNEST system will employ a slightly adapted mounting but will work in a similar way. The CERBERUS system has successfully evolved over many years and is able to monitor up to 600 contacts simultaneously. The SEARCHWATER radar is able to "look down" and track small, fast-moving targets over land and water or "look up" and track multiple aircraft. The "baggers" as the ASaC helicopters are affectionately called, proved their worth in Afghanistan, clocking up 3,000 flying hours and over 800 missions providing over-watch for NATO forces on the ground. At sea they have successfully provided reassurance for the RN and its allies in multiple operations since 1982.

The exact details of the range and capabilities of the new system are obviously not in the public domain but it will feature an improved human interface, better target identification and hardening against electronic jamming. The UKMoD has selected a very low-risk and affordable solution, building upon existing technology and fitting it on an aircraft that is already in service that will not need a new logistics or training pipeline.

In the current fiscal climate, MERLIN/CERBERUS was the only realistic option. Lockheed Martin had proposed a more sophisticated MERLIN-based option using a podded AESA radar, derived from the F-35, but it was obviously more expensive. Many would have liked to have seen a V-22 OSPREY-based ASaC solution, the tilt-rotor aircraft potentially offering better range and surveillance coverage, but unfortunately this is only paper concept and would

have added risk, time and cost, as well as adding an aircraft the UK does not (yet) possess to the inventory.

The correct choice has probably been made, but the UKMoD spent more than 17 years and some GBP40M on the CROWSNEST project in an excessively drawn out "assessment phase". In stark contrast, the original helicopter-borne AEW concept was developed on a shoestring in just 11 weeks and rushed into service in the wake of Falklands War.

### In Service, in Time, Mind the Gap

The first CROWSNEST kit is due to be delivered in October 2018 and fitted to an operational aircraft by June 2019. Initial Operating Capability for the ASaC MERLINS will be in 2020, although probably only 2 or 3 aircraft. Effectively there will be a 'capability gap', where the RN has no operational AEW capability, between 2018 and 2020.

824 Naval Air Squadron trains ASW MERLIN aircrew and will also take on ASaC training. Nearly 850 NAS personnel have already begun to convert from the SEA KING to the MERLIN, ready for the new CROWSNEST aircraft in 2018. Full Operating Capability for CROWSNEST (Ideally at least 6 aircraft and trained aircrew) should be achieved in early 2022, slightly ahead of the FOC for HMS Queen Elizabeth in the Carrier Strike role in 2023.

### Kits not Aircraft

With just 30 MERLIN HM2 airframes available to the RN, it is unfortunate that the CROWSNEST aircraft will have to be drawn from this fleet. To add to the pressures and delays, each HM2 will have to be withdrawn from service while Leonardo spends around 15 weeks adding wiring and mountings for the CROWSNEST kit. Fitting out all 30 aircraft will have to be spread over several years.

Theoretically, the CROWSNEST kit can be installed in any MERLIN in a process that should take around 24 hours: a MERLIN changing from the ASW role to ASaC will have its dipping sonar, sonobuoy carousel and ASW consoles replaced with the ASaC equipment. It is expected that between 6 and 8 MERLINS will have the ASaC kit fitted at any one time, with spares available at sea, which offers some useful flexibility as the carriers will need continuous ASaC capability most of the time. Switching precious ASaC platforms to ASW (or vice versa) is far from ideal: the MERLIN may have lower maintenance requirements than the SEA KING, but 13 aircraft are being replaced by 6-8 kits, fitted to aircraft in the existing fleet – another significant and unwelcome fall in the total number of available airframes.

CROWSNEST will be a small upgrade in capability, but having proved very useful in non-maritime environments, RAF ISTAR assets are stretched and our aircraft carriers need proper protection. There is a very strong case for expanding the number of aircraft, the obvious solution being to use the 10 "spare" MERLIN HM1 airframes in mothballs, even if they are not upgraded to HM2 standard. Even the very modest funds to refurbish these aircraft do not seem to be available and the Service is again obliged to compromise its capabilities due to budgets.

This report, lightly edited, is reproduced courtesy of [www.savetheroyalnavy.org](http://www.savetheroyalnavy.org)

# Climate Management on Naval Vessels

## HVAC and CBRN Protection Systems

**Dieter Stockfisch**

**The ability of a naval vessel to deploy as an integrated system and remain deployed is based to no small degree on properly functioning and effective climate control.**

That imposes immense demands on the climate control systems on naval vessels: They must withstand shocks and vibrations far beyond normal, with minimum noise emissions, the capacity to function in environments ranging from the Baltic to the tropics, intensive utilisation capability, low maintenance costs, and much more besides. In addition to the HVAC (Heating, Ventilation & Air Conditioning) performance functions usually provided on civilian ships, naval vessels require the vital

function of CBRN protection, shielding the crew and the material of the vessel against chemical, biological, radiological and nuclear threats.

In order to provide permanent CBRN protection and unlike the units of most other navies the ships of the German Navy are equipped with what is referred to as permanent protective air climate control (DSK). The vessel is permanently operated at an over-pressure by means of the CBRN protection stations, known as citadel op-

eration. The "citadel" is the part of the ship which is supplied with protective air, in other words filtered air which is free of CBRN elements. Most other navies work on the concept of "change over". With this approach, the vessels are operated openly under regular conditions, and only in threat situations they switch into citadel operation, known as Closed Ship Mode. In the scope of the Class 125 frigate programme the German Navy has raised the protection requirements for the ship as a whole, and this is clearly reflected in the climate control technology. An intense utilisation capacity and reduction in crew numbers in concert with the new multi-crew concept has brought along new challenges for the design of the climate management systems. Among other fac-

Image: Royal Navy



*The two aircraft carriers of the British Royal Navy's QUEEN ELIZABETH Class*



(Photo: BAABW)



**The BADEN-WÜRTTEMBERG, FoC of the German Navy's four Class F125 frigates**

Photo: AERIUS Marine



**AERIUS Marine ventilator fan module for the F125 frigate. Up to ten modules are installed per unit.**

Photo: AERIUS Marine



**Climate control centre of a cruise ship**

tors, a reduction of maintenance intervals and MTBF analyses (Mean Time Between Failures) constitute priorities for the design of the HVAC system.

A company which has successfully designed and built HVAC systems in response to such challenges for decades is Hamburg-based AERIUS Marine GmbH. The company is a leading specialist in systems for climate control and fire protection on naval vessels and cruise ships alike. AERIUS Marine has its roots in the company Rud. Otto Meyer, which was established in 1858, and which supplied heating systems for the ships of the German Imperial Navy. Since then, AERIUS Marine has developed into a concern operating on a worldwide scale, with 450 staff members in Germany, France, Great Britain, and India. Plans for the current year include the establishment of new branches, AERIUS Marine Canada and AERIUS Marine Australia. About 50 percent of AERIUS' total turnover today is generated from naval programmes. In this context, as part of its commitment AERIUS Marine not only considers the supply for new building programmes, but rather support during the entire life cycle of the ships. An in-house ILS department (Integrated Logistic Support) provides the customer with spares, maintenance, obsolescence management etc. and is fully integrated in the design process for installations and systems at AERIUS.

AERIUS Marine can look back on more than just vast experience in the scope of more than 50 cruise ship programmes. When it comes to naval shipbuilding, AERIUS Marine's expertise is based on experience from both the German and numerous international navies. The company is an expert in all kinds of CBRN systems. Recent references include the Class F124 and F125 frigates and the task group support ship (EGV) BONN for the German Navy. Since 2004 AERIUS Marine has been fitting out the new aircraft carriers QUEEN ELIZABETH and PRINCE OF WALES for the Royal Navy with turnkey HVAC/CBRN installations, as well as the cold water systems, including the chillers and heating systems. For the Royal Navy's new Type 26 frigate programme, AERIUS Marine is the single-source service provider for the development and construction of the HVAC/CBRN system. The naval portfolio is rounded off by orders in Poland (OPV) and in India, where a fleet support vessel is being fitted out with climate control and ventilation systems, as well as with the chillers. And for the Israeli Navy, AERIUS Marine is equipping four corvettes with fire protection by way of low-pressure water mist systems and gas fire extinguishing installations. ■

## Q&A:



Photo: AERIUS Marine

### Thomas P. Arlit, CEO of AERIUS Marine GmbH

**ESD:** What sets AERIUS Marine apart from other companies on the market?

**Arlit:** For more than 20 years we have been almost exclusively involved with fitting out naval and cruise ships. We have focused on these market segments because climate control is mission critical for both classes of vessels. On a cruise ship, the quality of the climate control technology influences the tourists' experience of the ship, and on a naval vessel our systems are responsible, for example, for protecting the crew against CBRN threats. Unlike other generalists, the fact that we have focused in this way means that we have a vast range of knowledge as to how a naval vessel is operated, and what demands and challenges are going to be imposed on our climate control systems. Without this understanding, climate control technology will always be a dark horse in the ship as an integrated system, difficult to integrate, and incapable of supporting the mission of the ship and its crew. Another difference is that we can offer our customers turnkey production. In other words, we cover the entire chain, from preliminary studies to design, from component procurement and logistics to installation and commissioning. And after the delivery of the ship the support continues by way of our ILS team. For example, we have just received the order to ensure spare parts supply, obsolescence management, conversions, training, documentation, and so on for a number of classes of vessels of a European navy. Control will be maintained on the basis of availabil-

ity parameters. Another very specific example which sets us apart from the competition is our ability to handle logistically more complex naval projects. For instance, we handled the equipping of the blocks of the British aircraft carriers at six dockyards in Great Britain. With a material flow with peak values of more than €2 million per month, the logistics demands could only be met by our processes and systems, which are tried and trusted in the building of cruise ships and have really proved their worth. When it comes to the German Navy projects, too, this complex form of management using different dockyards, which often operate in very different ways, is becoming normal practice, such as with the task force support ship BONN.

**ESD:** What challenges must AERIUS Marine overcome in the conception and installation of its systems?

**Arlit:** As system integrators, we ensure that a very large number of climate control components and modules, which are to be found in every nook and cranny of the ship, are seamlessly integrated with both the climate management element as well as with all of the ship's systems. For example, if everything except the climate control technology were to be masked out of a 3D model of a vessel, the representation of the ducting and piping networks would still provide a complete image of the ship's contour. The ducting and pipework of an average frigate alone weigh about 140 tonnes, and are about eight to ten kilometres in length. This results not only in the challenges already mentioned for material logistics, but also calls for immense co-ordination of interfaces with almost all the other areas of work at every phase of the ship's construction. Our work may represent only about three to five percent of the total costs of the vessel, but it has an over-proportional significance and importance, due to its presence throughout the ship, and due to the number of interfaces involved. Added to that is the issue of modifications, which ushers in a further level of complexity for our project management.

**ESD:** Where is the development of climate control systems for naval vessels heading?

**Arlit:** With classes of ships of which the conceptual origin lies in the 1980's and 1990's, the demands on the climate control systems were based on quite specific

mission profiles, such as operations in the North Sea and the Baltic. Likewise, the maintenance concepts and the degree of automation were oriented around criteria which originated from the forms of operation from Cold War days. With today's mission profiles for the vessels, however, which are manifestly less clear-cut with regard to region as well as content, the demands on the climate control systems have fundamentally altered in the past few years. In principle, use anywhere in the world is specified, which means complete and continuous cooling and dehumidification, and not just ventilation and heating, and, among other things, involves considerable challenges with regard to the spatial integration of these additional part systems. In every respect, the significance of what might be referred to as intensive utilisation capacity for the Class 125 frigates has exceeded all expectations. The operating costs are increasingly playing a part, too, since after the propulsion systems the climate management systems are the largest consuming elements on board a naval vessel. Here, AERIUS Marine can transfer experience from the cruise ship sector, where energy efficiency has long played a major part. And, not least, I would also like to mention that the criterion of comfort is also becoming more significant. True, as before, a frigate is not a cruise ship, but the crew can still expect today's systems to provide a certain degree of comfort with regard to regulation control, low noise levels, exclusion of draughts, and so on. In years to come, the development that ships should be able to be used universally, and are able to be operated more effectively and more easily, is going to be paramount. We are meeting this development by modularisation, automation and the application of decentralised concepts. Another trend is undoubtedly going to be the mixed use of specially introduced parts and what are known as COTS equipment (Commercial Off The Shelf, i.e. civil standard components) for areas which, with regard to the type of use, do not necessarily need to be applied the demanding navy standards. In these cases we can score points with our experience from the construction of cruise ships because, up to now, cost-performance considerations have always been more sharply in focus than in naval shipbuilding.

**The questions were asked by Dieter Stockfisch.**



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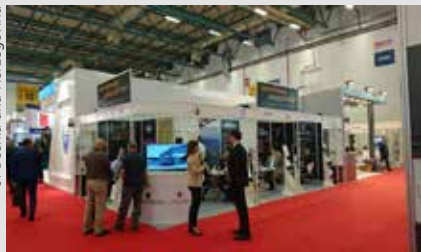
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## Defence Industry of Bosnia and Herzegovina

(ck) For the first time, the defence industry of Bosnia and Herzegovina participated at this year's IDEF exhibition in Istanbul. Eight companies exhibited in the B&H pavilion: Igman Konjic, Unis Ginex Goražde, Pre-

Photo: Foreign Trade Chamber of Bosnia and Herzegovina



tis Vogošća, Tvornica remonta Bratunac, Pobjeda Technology Goražde, Ac-Unity Goražde, Binas Bugojno and Unis Group Sarajevo. These companies produce explosives, ammunition, percussion primers, boosters for artillery and anti-aircraft ammunition, detonators and igniters for grenades and missiles, fuses, grenade launchers, mortar and artillery ammunition, antitank and tank ammunition, and bombs. The defence industry is one of the drivers for economic growth in Bosnia and Herzegovina. It exports to nearly 50 countries worldwide. It is a fast-developing industry with export value of US\$75M in 2016, which is 23% higher than in 2015. The main export markets are Egypt (26%), Saudi Arabia (20%) and USA (15%).

## 2nd Eastern Europe Defence Week 2017

(ck) The 2nd Eastern Europe Defence Week in November 2017 in Warsaw, Poland aims to help Eastern European nations to strengthen collective defence and optimise procurement processes by facilitating an environment where industry will be able to develop partnerships and share knowledge. Because of increased instability, Eastern European states see the necessity to strengthen collective defence. Facing a challenging security environment, the region's countries seek to modernise their armed forces and are looking for partners to assist them. The conference aims to give attendees an understanding of recent trends in defence procurement and will allow participants to connect with decision makers from the region's relevant entities. Speakers are decision makers from NATO (NATO Defence Investment, NATO Support and Procurement Agency, NATO Industrial Advisory Group) and from the region's most relevant MoDs (Poland, the Czech Republic, Bulgaria, Romania and more).

The last conference was attended by 130 companies from 15 countries. The second conference will see participants from Airbus Defence & Space, Boeing, Lockheed Martin, Rheinmetall, Dynamit Nobel Defence and others.

2nd Eastern Europe Defence Week 2017, 6-7 November, Warsaw, Poland  
[www.easterneurope defence.com](http://www.easterneurope defence.com)

## Kent Periscopes to Cooperate with Marketing Agency Chamois

(ck) Kent Periscopes, a UK based supplier of periscopes and vehicle sights for armoured fighting vehicles, has signed a contract with the UK based marketing agency, Chamois Consulting Ltd. Chamois will provide an integrated marketing service. Already established in the armoured vehicle market, Kent Periscopes want to increase sales. Chamois will support Kent's growth strategy by assisting them in improving the profile of their brand. Kent Periscopes' sighting solutions are used by numerous armoured vehicle manufacturers. Kent manufactures vision periscopes, Embedded Image Periscopes (EIPs), a range of Sabre Gunner/Commander sights, the Passive Driver's Periscope (PDP), Vision Blocks and other related equipment for armoured vehicles.

Kent also have a spares and repairs facility to refurbish periscopes and legacy sighting systems. Kent have won contracts with major vehicle OEM's primes and integrators across the globe including in the Middle East and Asia Pacific regions. In UK, Kent are supplying periscopes to General Dynamics and an auxiliary sight to Lockheed Martin for the UK Scout SV programme. Kent also have been selected to supply their Embedded Image Periscopes (EIP) to Lockheed Martin for the Warrior Capability Sustainment Programme (WCSP).

## NIDV Symposium on Public Security

(ck) During the Dutch NIDV Symposium on 30 November 2017 in Ahoy, Rotterdam, representatives of the Dutch government and industry will voice their opinions on the ability of Dutch public security organizations to adapt to a changing security environment. The Minister of Defence of The Netherlands is striving for adaptive armed forces based on the Total Force Concept. In addition, the police and the fire brigade are also undergoing developments that are intended to lead to greater adaptivity. As a result, government officials and industry leaders are discussing whether the Dutch

## Excelitas Qioptiq Supports the Antarctica Ice Maidens

(sb) Excelitas' Qioptiq is recognised as a primary supplier to many of the defence and aerospace sector's foremost companies and the world's militaries, with a product range that includes some of the most advanced optical technologies ranging from Night Vision Sights to Head Up Display Optical modules through to Space Components, all of which will be on display at DSEI. But it's not just about supply and support

Image: Qioptiq



of equipment; the company looks to support UK service men and women, and is a Gold member of Team Army. Sport is critical to welfare and morale, and Qioptiq's sponsorship helps to make sport more accessible for both able-bodied and injured troops to compete. The association with Team Army presents the opportunity

to enable service men and women to engage in golf, sailing and skiing as well as supporting other endeavours such as the Ice Maiden expedition.

Ice Maiden: - in November 2017 five British women (all serving in the British Army or Army Reserve) aim to become the first all-female team to ski coast-to-coast across Antarctica. No team of women, from any nation, has completed this formidable challenge. Qioptiq are proud of what they do and honoured to support Team Army and the extraordinary Ice Maiden endeavour. For more information see <http://excicemaiden.com/> and <http://teamarmy.org/>



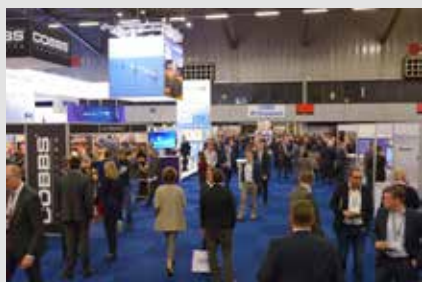


Photo: NIDV

defence and security branches are sufficiently adaptive, proactive, future-proof and flexible. The top political level of the Ministries of Defence, Economic Affairs, Foreign Affairs and Security & Justice and members of the Dutch States General will also attend the symposium. Representatives of the armed forces, the police, the fire brigade, the ambulance service, the coast guard and other public security organizations will also be present. During the symposium, more than 130 companies will show their potential. Security organizations and businesses will comment on important security issues during the breakout sessions.

[www.nidv.eu/symposium/](http://www.nidv.eu/symposium/)

## I/ITSEC 2017

The 2017 Interservice/Industry Training, Simulation and Education Conference (I/ITSEC) promises to be one of the most exciting and comprehensive yet. To be held from November 27th to December 1 at the Orange County Convention Center in Orlando, Florida, the exhibit hall space for year's event is already close to selling out. Attendance, bolstered by more liberal government travel regulations, is expected to at least equal last year's 15,000, while high-level representation, both American and international, is also expected to be significant. As industry awaits further clarification from the administration on spending plans for the military and national security, expectations of an enhanced fiscal environment are reflected in the early demand for exhibit space in the Convention Center. The theme for I/ITSEC 2017, „Harnessing New Technologies to Win in a Complex World“, testifies to the wide range of front line technologies that will be on display on the exhibit hall floor, as well as the subject of dozens of special events and technical paper presentations. Emblematic of the pioneering nature of I/ITSEC, „Operation Blended Warrior“ will again be a prominent feature this year. A scenario-driven, floor wide four day exercise involving private exhibiting companies and numerous government agencies, OBW will explore the nexus between live, virtual and con-

structive simulations and how their interaction in a fast-paced, complex and shifting environment can be incorporated into lessons learned. Other cutting edge events will include Black Swan, an exploration of low probability, high consequence events and how modeling and simulation can be used to analyze their implications and consequences to identify optimal outcomes. Other key elements of I/ITSEC 2017 include an international Serious Games Competition, now recognized as one of the leading worldwide events of its kind, as well as over a dozen special events and other presentations focusing on the entire range of modeling and simulation applications. With the advent of Artificial Intelligence, Augmented and Virtual Reality, as well as the fast-approaching revolution in military and security technologies, I/ITSEC 2017 is not to be missed.

[www.iitsec.org](http://www.iitsec.org)

## HENSOLDT Acquires EuroAvionics

(df) HENSOLDT announced that it has taken over the Pforzheim-based company EuroAvionics GmbH, a supplier of avionics systems for helicopters and UAVs. Now that all the legal requirements have been met, the signed share purchase agreement has taken effect. HENSOLDT expects the takeover to give their existing avionics business a new boost as part of their growth



Photo: EuroAvionics

strategy. „The takeover of EuroAvionics is the perfect example of a strategic acquisition since both parties generate added value from our collaboration,“ said Celia Pelaz, Head of Strategic Business Development. „We can now develop a comprehensive avionics product line at HENSOLDT by combining the strengths of EuroAvionics in the civilian market and our own portfolio, which has primarily been geared towards the military up until now.“ In this way, HENSOLDT will improve its access to civilian helicopter manufacturers and fleet operators. EuroAvionics Group generates revenues of approx. €20M with around 100 employees. They are particularly strong in the market for civil certified avionics equipment for helicopters with interfaces to avionics and

sensor systems supplied by third-party providers. Their portfolio includes flight management systems as well as avionics computers and autopilot systems, particularly for UAVs. Apart from the headquarters in Pforzheim, the company has subsidiaries in the UK, the US and Switzerland.

## Harel Locker Elected as IAI's Board Chairman

(df) Israel Aerospace Industries (IAI) board of directors elected Adv. Harel Locker for the position of the board's Chairman. The appointment will be sent for approval to the government's Companies Authority



Photo: IAI

Appointments Committee and for final approval by the Israeli Minister of Defence and Minister of Finance. Harel Locker was in charge as the Prime Minister's Office Director-General from 2011 to 2015. Under his responsibilities were the government's socio-economic policies and programmes and the approval of Israel's state budget, including the defence budget. Locker led many international partnerships and strategic national programmes such as the relocation of central IDF bases to the Negev, establishment of the Government Cyber Authority, development of settlements in the Negev and areas surrounding the Gaza Strip after Operation Protective Edge, reforms in regulations governing parallel marketing of food, the privatisation of Israel Military Industries, the digital Israel project and more.

## NATO Opens CERT in Jordan

(df) NATO and the Jordanian Armed Forces inaugurated the newly established Computer Emergency Response Team (CERT) in Amman on 19 July. The CERT was set up as part of a NATO Science for Peace and Security (SPS) project to enhance Jordanian cyber defence capabilities. Jordan's geographical location and security environment – the conflict in Syria and Iraq on its borders, the refugee crisis in the region and the threat of terrorist organisations such as ISIL – make the country vulnerable to a number of threats. Particularly challenging are cyber attacks. Launched in 2014, the SPS project – led by experts from Germany and Jordan and further supported by France and the United States – responds to a key national priority

and forms part of the Defence and Related Security Capacity Building (DCB) package for Jordan. The DCB Initiative reinforces NATO's commitment to partners and helps to project stability beyond NATO's borders by providing support to nations requesting defence capacity assistance from NATO.

## New Executive Director for Australian Submarine Programme



Photo: Naval Group

(bk) Naval Group announced that Jean-Michel Billig commences as the Executive Director to work with the Commonwealth of Australia and Lockheed Martin Australia on the Australian Future Submarine programme. Billig joined the company in May 2017 as special advisor to Hervé Guillou, President and CEO. He will contribute in finalising all the contractual and industrial provisions that will underpin the success of the programme. During the last two years Jean-Michel Billig was CEO of Zodiac Seats and member of the Executive Committee of Zodiac Aerospace. From 1988 to 2012 he worked for the EADS Group. He was responsible for the technical management of Eurocopter, which later became Airbus Helicopters and from 2003 to 2007, he was appointed director at Airbus Military on behalf of France for A400M.

## Olivier Janin to Head Marketing at Dyneema

(ck) Olivier Janin joined DSM Dyneema as its Vice President of marketing and sales. He will report directly to DSM President Golnar Motahari Pour. Mr. Janin has broad global experience in sales and marketing and P&L positions in the material science sector. Most recently he served as Sales Director for Saudi Arabia Basic Industries Corp. Olivier Janin graduated with degrees in business administration and industrial marketing from the University of Exeter in the U.K. and from Paris-Sud University in France. DSM is the inventor and manufacturer of Dyneema fiber. Dyneema fibers offer maximum strength combined with minimum weight. Dyneema is up to 15 times stronger than quality steel and up to 40% stronger than aramid fibers, both on weight for weight basis. Dyneema is an important component in ropes, cables and nets in the fishing, shipping and offshore industries. Dyneema is also used in safety gloves for the metalworking industry and in applications in the medical sector. Dyneema is also used in bullet



Photo: DSM Dyneema

resistant armour and clothing for police and military personnel. DSM delivers annual net sales of about €10Bn with 25,000 employees.

## Manroy is now FNH UK

(ck) Three years ago, the Belgian small arms manufacturer FN Herstal bought the British weapons supplier Manroy Engineering headquartered in Sandhurst, Berkshire. Since its acquisition by FN Herstal, Manroy Engineering has followed a programme of integration within the Herstal Group. This has included product alignment with FN Herstal, investments to modernise the UK production facilities and a wider product portfolio. As part of the integration process, the UK business will adopt FN Herstal's name. Glyn Bottomley, FNH UK CEO says: "Manroy Engineering was originally formed in 1975 and has been a supplier of weapon parts and weapons to the UK MOD throughout. Since its acquisition Manroy, now FNH UK, has undergone transformation in the areas of manufacturing and capacity. The corporate integration of the business within FN Herstal will enable FNH UK to offer the UK market the full range of products from the FN Herstal portfolio, which includes FN SCAR assault rifles, FN MINIMI Mk3 machine guns, and airborne, land and sea weapon systems."

# Preview

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