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European Security & Defence

€8.90
D 14974 E

10/2020

International Security and Defence Journal

Medium Tactical Vehicles

- Modernisation of the RNoN's MCM Capabilities
- NATO's Collaborative Programmes
- Modernisation of the Czech Armed Forces
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October 2020 • www.euro-sd.com • ISSN 1617-7983

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Grumpy Old Men

Between this and the next edition of Europe's leading defence and security journal the world of US politics will rear its ugly head and bite us all – again. In a year of high drama, not to mention tragedy, the US still leads in its perplexing way; perplexing to a continent where anything other than an apolitical military and a neutral judiciary was, at least until very recently, unthinkable. In the US, and more generally around the globe, modern, democratic governments have failed in their duty to protect their citizens, and not just from COVID-19. Popular media and professional pollsters suggest that we may soon see the back of Mr Trump, but wait a moment! Thousands of unopened ballot papers from 2016; stories of gangs knocking on doors to deliver pre-filled ballot papers to vulnerable voters, and the anarchic, fiery – "but mostly peaceful" – scenes in US cities suggest that a landslide might well be on the cards, given Mr Trump surviving his latest brush with COVID-19. Another interesting development in the US has been the emergence of the suburban ladies – a key demographic – who dare not declare their true allegiance for fear of what the neighbours, coffee circle, tennis club etc. might say. A fair fear; they may well be decisive. We watched that exchange of moderately hostile personal attacks masquerading as a debate, and neither gentleman came away as such, but the European liberal assertion that "Trump is broadly and deeply unpopular in our country", is a media-driven mirage and, in general, simply not true.

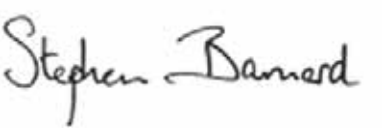
It is a small step from Mr Trump to Mr Johnson, currently embattled against almost everyone, it seems. However, his one major failing so far has been to try to follow the best advice available regarding COVID-19. That that advice, from the WHO downwards, (and through the US CDC) to the UK's halls of higher education, modelling and medicine has twisted and turned like a baker kneading dough, seems to have escaped most of the British media, and the British public have allowed themselves to be deceived. They, and other European populations, will be deceived again if the annual death toll due to flu is allowed to be attributed to COVID-19.

As for the latest, hugely-criticised-by-almost-everyone, Internal Market Bill, putting the UK in a position where it might allow itself to break international law, well, that remains a necessary gambit. As soon as the EU "negotiator" put the smoking gun of a trade blockade between Northern Ireland and the rest of the UK on the table, it was nothing more than a logical, necessary, (forced) legal move. It is reminiscent of "Love, Actually", and Prime Minister Hugh Grant's speech about David Beckham's right foot – and about relationships: when a relationship becomes toxic the best thing to do is cauterise it. This is the EU-UK dance, as one bad faith demand follows another. Oh, and by the way, Joe, when it comes to UK politics and Ireland, "Will you shut up, man?"

Brexit aside, what about the EU? ESD has recently been to two "live" exhibitions in Poland and Bulgaria, and both countries are fine examples of the positive benefits of EU largesse, but why does the EU deem it necessary, or possible, to raise and finance an EU Army to the logical detriment of NATO's capabilities? Like it or not, Mr Trump's position here is not entirely wrong.

Continuing this autumnal tour d'horizon, we come to NATO capabilities, driven by the doable versus the desirable, and budgets drive both. Within NATO lies Germany, and within the FMoD and BAAINBw lies the new defence budget, and the Heavy Helicopter (STH) requirement and programme. But perhaps it doesn't any more: "Cancelled" may be the correct translation, but is not necessarily a true reflection of where the military/industrial/political impasse has reached. It seems fair to say that money is the root of the problem. It's Clouseau rather than Clausewitz, but it also seems fair to say that if Germany were in fact allocating 2% of GDP to defence, the case would be "solvèd, Inspector". There is no good excuse.

Back to the coronavirus. Compared with many industries, Defence (and Security) remain necessities, and many of us professionally centred on them should acknowledge how privileged and protected we are. Praise the Lord! – and pass the ammunition…



Stephen Barnard

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A new era of collaborative EU/NATO programmes is currently being ushered in, allowing the NATO nations to reduce costs.

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The CEZERI Flying Car

(kö)The CEZERI Flying Car, developed by Turkey's Baykar company, a MALE UAV manufacturer, could undertake its first manned test flight 1.5 years after commencing its conceptual design under the direction of technical director, Selcuk Bayraktar, son-in-law of President Recep Tayyip Erdogan. The first unmanned test flight was carried out on 11 September 2020 with safety ropes attached, followed by an untethered flight a few days later on

Photo: Baykar

15 September. The first prototype, constructed from composites, weighs 230 kg, can fly completely autonomously, and employs an intelligent flight system. The test flights were carried out with different requirements, and took place at night. The CEZERI will be produced for civilian use at first, but the Turkish defence industry has been working intensively in the research and development of UAV technology, especially in the field of Kamikaze and combat drones, for the last thirty years. The CEZERI, employed as a manned combat drone in tandem with small unmanned combat drones in swarm or cluster mode, could be the forerunner for new tactical forms of warfare. They could be engaged for border security tasks, operating in both difficult and open terrain, and also in urban environments The CEZERI is named after the renowned Muslim polymath and founder of robotic science and cybernetics, Ismail al-Jazari from the 12th and early 13th century. Al-Jazari is also remembered as the chief engineer of the Artuklu Palace and creator of the famous robotic Elephant Clock, which used a water weight mechanism to track time.

Long-term Ammunition Framework Agreement with the Netherlands

(gh) The Dutch Armed Forces ensure the coverage of their ammunition needs through long-term framework contracts. For the land forces, the Dutch procurement agency Defence Materiel Organization (DMO) has now concluded a ten-year framework agreement with Rheinmetall for the supply of 35mm medium-calibre ammunition for infantry fighting vehicles, 40mm ROSY smoke ammunition and modern 155mm artillery ammunition with an annual volume of €50 million. Rheinmetall is thus continuing its long-standing cooperation with the Netherlands, which was only strengthened last year with the conclusion of a partnership agreement. In conjunction with the partnership agreement, Rheinmetall has assumed responsibility for the complete 155mm portfolio, which ranges from the current Assegai ammunition range to modular charges and fuzes. Through this framework agreement, DMO aims to ensure the supply of state-of-the-art, high-performance ammunition to the Dutch armed forces – now and in the future. Initial call-offs under the new framework contract are in preparation on the customer side.

Photo: Rheinmetall

Explosive Disposal Robot

(ck) Most recently, the company aunav has presented the aunav.NEO explosive disposal robot to a wider audience. The vehicle can adjust its width during a mission to suit any environment at any time, including narrow airplane aisles, among others. The robot, developed at the aunav facilities in Huesca, arose to meet the needs of security and armed forces. It is capable of operating in areas that are difficult to access which makes it prepared to neutralise improvised explosives, ammunition or CBRN threats (Chemical, Biological, Radiological, Nuclear) in tight spaces such as planes, busses or subway aisles or underground tunnels and naturally, it does very well on rough terrain. In the case of airplanes, this fusion of technologies allows the aunav.NEO to climb an airplane's stairs, adjust its width to manoeuvre through the aisle, open the upper hand luggage compartment and pick up and remove a suspicious object that was placed inside.

Photo: aunav

Germany Cancels STH Tender

(jh) The German Ministry of Defence has cancelled the tender procedure for the Heavy Transport Helicopter (Schwerer Transporthubschrauber – STH) project. In the course of the current awarding procedure,

Photo: ES&D

the procurement authorities have raised doubts that the project can be implemented on budget while meeting all requirements. Both Lockheed Martin/Sikorsky and Boeing had submitted bids. The Federal Office of Bundeswehr Equipment, Information Technology and In-Service Support (BAAINBw), the country's procurement authority, has assessed the present offers as uneconomical and has therefore cancelled the award procedure. As a result, the programme will have to be reconsidered, with significant delays expected, because the initial plan to award a contract in 2021 can no longer be met. However, the objective to replace the Bundeswehr's current CH-53G helicopter fleet remains.

Latest Version of UH-72B LAKOTA

(gh) At the National Guard Association of the United States (NGAUS) virtual exhibition in Washington D.C. in August, Airbus Helicopters announced the launch of the latest version of the LAKOTA type helicopter, with an order for 17 aircraft. The UH-72 belongs to the widely used H145 family, the military and civilian versions of which are in use with the German Army and numerous police forces. Since 2006, Airbus Helicopters has delivered

Foto: Airbus Helicopter

over 460 UH-72As to the US Army, with the 463rd and final aircraft scheduled for delivery in September 2020. These are used by the Army, Navy and National Guard and have already completed more than 800,000 flight

hours, with the first UH-72B to be handed over next year. The most important improvements of the B version are the introduction of the FENESTRON rotor at the tail, more powerful engines, improved controls and the HELIONIX avionics suite to reduce pilot workload. The aircraft's mission spectrum includes search and rescue missions, disaster relief, drug control operations and life-saving MEDEVAC flights. In addition, the LAKOTA is used for primary training of the Army's helicopter pilots. In retrospective, Airbus Helicopters stresses that the UH-72A Lakota fleet has been delivered on time and within budget for more than 15 years, as have the numerous H145 and H145M programmes.

Japan to Buy More AMRAAMs

(JC Menon) Japan will buy another lot of 32 AIM-120C-8 Advanced Medium Range Air-to-Air Missiles (AMRAAM), with support, for an estimated cost of US$63m, with Raytheon Missile Systems acting as the prime contractor. The State Department has made a determination approving the possible Foreign Military Sale to the Government of Japan and the Defense Security Cooperation Agency delivered the required certification notifying Congress of this possible sale. Japan already has the AMRAAM in its inventory and will have no difficulty absorbing the additional missiles into its armed forces. According to Raytheon, the AMRAAM is one of the most sophisticated, combat-proven, air dominance weapons. With more than 30 years of design, upgrades, testing and production, the AMRAAM missile continues to meet warfighter requirements in all weather and beyond visual range. Its capabilities have been fully demonstrated in over 4,800 test shots and more than 10 air-to-air combat victories. It uses a combination of inertial guidance, midcourse updates and an on-board active radar to find the intended target and complete the intercept. Because of continual development and ongoing modernisation, it remains the gold standard for the air dominance arena.

Photo: via author

First AMPV Ready for Delivery to US Army

(jh) The first Armored Multi-Purpose Vehicle (AMPV) has driven off the BAE Systems production line to be delivered to the US Army. The AMPV is central to the Army's modernisation objectives and comes in five variants to meet a wide range of missions across the battlefield. Identified by the Army as a top priority for safety and survivability, the AMPV family provides the Army with a highly survivable and mobile fleet of vehicles that address a critical need to replace the Vietnam War-era M113s and manoeuvre with the ABCT in challenging terrain on the front lines. Under the current low rate initial production contract awarded in 2018, BAE Systems will deliver more than 450 of these vehicles. The Mission Command vehicle will be the first vehicle delivered and is the cornerstone of the Army's ABCT Network Modernization Strategy. It facilitates digital mission command, taking advantage of increased volume, protection, power and cooling capabilities and provides flexibility

Photo: BAE Sytem

TCI RFML COMINT Systems Employ Artificial Intelligence

TCI International, Inc. is leveraging its 50+ years of radio frequency (RF) spectrum expertise implementing RF machine learning (RFML) into its BLACKBIRD COMINT / SIGINT solutions when it releases its new hardware platform in 2021. TCI is developing RF signal processing that will apply machine learning to time-series I/Q radio samples and channel measurements, enabling it to learn from data.

RFML employs a form of artificial intelligence (AI) to learn the characteristics of RF signals in order to detect and identify them. The process includes training an RFML engine using real-world RF signals to enable their detection and classification in near real time. By training the system to learn signals from the I/Q representation, systems can achieve better performance than traditional decision-tree approaches. TCI will utilize real-world signals to train the RFML engine, ensuring the neural network is able to rapidly learn new signals and quickly adapt to changing RF environments.

Photo: TCI International

TCI's RFML implementation, dubbed BLACKBIRD EDGE, moves signal processing, identification and geolocation to the sensor at the edge of the network – a process known as edge computing. In tactical military deployments, TCI's innovative solution enables faster RF situational awareness, threat assessment and countermeasures engagement. BLACKBIRD EDGE can move decision-making down the chain of command to the front lines during rapidly evolving engagements, and then supply actionable intelligence up the command structure and populating a common operational picture.

Thus, military forces can derive both strategic and tactical benefits from COMINT / SIGINT without having to choose between the two.

and growth capacity for command, control, communications and computer capabilities. The other variants in the AMPV family include:

- The General Purpose vehicle: operates throughout the battle space to conduct resupply, maintenance, and alternate casualty evacuation from point of injury;
- The Mortar Carrier: provides immediate, and responsive, heavy mortar fire support to the ABCT in the conduct of fast-paced offensive operations;
- The Medical Evacuation vehicle: enables immediate treatment or evacuation at the point of injury to either ambulatory or litter casualties;
- The Medical Treatment vehicle: is the first of its kind, serving as an "operating room on tracks" for life-sustaining care to Soldiers suffering from life-threatening injuries.

The AMPV has built-in growth to add new capabilities as technology evolves, including enhanced power generation for advanced electronics, and network connectivity. The AMPV has completed nearly two dozen Army tests and has consistently met or exceeded all of its requirements. Work on the AMPV programme takes place across BAE Systems' industrial network, which includes facilities in Aiken, S.C., Anniston, Ala., Phoenix, Ariz., Sterling Heights, Mich., and York, Penn.

Lithuania Introduces SFP9-SF Paddle Pistols

(gwh) The Lithuanian Armed Forces will be equipped with SFP9 SF paddle pistols by the end of 2021 following a contract concluded with Heckler & Koch that amounts to €1.57M and includes the training of personnel on the new weapon. In addition, an option for the delivery of further pistols was agreed. With the introduction of the SFP9 SF in the NATO standard calibre 9x19mm, the Lithuanian Ministry of Defence wants to introduce a modern weapon in accordance with the current military requirements and enforce the introduction of a uniform calibre. So far, Austrian GLOCK 17, American COLT 1911 and Czech ČZ75 pistols with different calibres have been used. The existing pistols are to be stored in reserve and will be used only in case of bottlenecks. The Striker Fired Pistol (SFP) is used as a police weapon in Germany, Luxembourg and Switzerland while it is also widely used in the civilian market in the US.

Hungary Signs LYNX Contract

(jr) Hungary has ordered 218 LYNX Infantry Fighting Vehicles (IFVs) from Rheinmetall in a deal worth more than €2bn, making

Photo: Rheinmetall

the country the first NATO and EU member state to order the type. This important contract represents a major breakthrough in the global defence market for the Düsseldorf-based technology group's innovative new combat vehicle. The contractual agreement, which has now been signed in Budapest, encompasses 218 LYNX KF41 IFVs and nine BUFFALO Armoured Recovery Vehicles (ARVs). The contract includes additional products and services such as simulators, training and instruction plus an initial supply of spare parts as well as maintenance support. The Lynx IFVs will be equipped with a manned 30mm LANCE turret, also developed by Rheinmetall. Given an expected service life of several decades, the LYNX will require spare parts and regular maintenance in order to remain operationally ready, meaning the company sees further potential orders stemming from this contract. During a first phase of production, Hungary is to receive 46 LYNX IFVs as well as nine BUFFALO ARVs, all built in Germany, with delivery to be complete by the start of 2023. In the second production phase, an additional 172 LYNXs will be built in Hungary to meet the full needs of the country's armed forces. To this end, the Hungarian government and Rheinmetall agreed in August 2020 to establish a joint venture responsible for creating a LYNX production facility in Hungary, to be financed by a local company. Rheinmetall will hold a majority stake and take the lead in the joint venture company, a process in which Hungary will make a material investment in the project in the form of a newly constructed production facility. The resulting centre of excellence for the development, production and maintenance of armoured vehicles will create an important nucleus for the Hungarian defence industry. This constellation will ensure that a substantial share of the added value deriving from the procurement project takes place in the customer country. For Hungary, this procurement order represents a big step in its efforts to introduce a new generation of military equipment, with key systems that meet the latest NATO standards. The LYNX is currently competing in similar procurement programmes in the neighbouring Czech Republic as well as in Australia. It is foreseen that a majority of the LANCE turrets for the first phase will be produced and supplied from the Rheinmetall Military Vehicle Centre of Excellence in Brisbane, Queensland, Australia.

Northrop Grumman Developing TITAN Ground Station Prototypes

(jr) Northrop Grumman Corporation has been selected by the Defense Innovation Unit and the US Army Tactical Exploitation of National Capabilities (TENCAP) office to develop two prototype ground stations for the Tactical Intelligence Targeting Access Node (TITAN) system. This will be a scalable and expeditionary intelligence ground station that will leverage space, high altitude, aerial and terrestrial layer sensors to provide targetable data that allows commanders at all echelons to quickly assess threats to their forces. In this prototype effort, Northrop Grumman's deployable and semi-autonomous ground station prototypes will demonstrate the value of space assets in improving battlefield awareness and tactical intelligence in Anti-Access/Area Denial (A2AD) environments. The system will also help connect the joint force by providing near real-time intelligence using artificial intelligence and machine learning techniques to rapidly deliver fused data from multi-domain sensors to weapon platforms, such as artillery, jammers, and airborne systems. By leveraging commercial and military space assets, the system will facilitate deep-sensing, reduce sensor-to-shooter (S2S) timelines, and maximise the effectiveness of Long Range Precision Fires (LRPF). A separate TITAN acquisition will provide mobile ground stations that link to terrestrial, high-altitude and airborne sensors to provide targeting data to the Army. Northrop Grumman teams recently demonstrated a software architecture to the Army that is capable of fusing multi-domain sensor data and reducing the sensor-to-shooter timelines. This common software architecture is the basis of the Northrop Grumman space-to-ground TITAN prototype system, potentially enhancing the integration of space-based data systems with the mobile ground stations in later phases of the TITAN program. The prototype phases are expected to support multiple demonstration exercises in 2022 and 2023.

New Rohde & Schwarz ELINT Processor

(jr) Rohde & Schwarz has launched a high-performance Electronic Intelligence (ELINT) receiver that incorporates cutting-edge radar detection technology in the form of the R&S

WPU2000 wide-band processing unit. Following the success of the R&S WPU500, the newly introduced device increases its real-time bandwidth to 2 GHz, a new processing unit that will be the new core of radar signal collection and analysis systems from Rohde & Schwarz. R&S WPU2000 covers a broad frequency range (20 MHz to 18 GHz optionally extendable down to 8 kHz or up to 40 GHz). Its 2 GHz real-time bandwidth allows interception and analysis of complex wide-band signals emitted by state-of-the-art frequency agile radar systems. R&S WPU2000 copes with any radar environment and intercepts even weak signals of low-power radars, due to its sensitivity and high dynamic range. Its high detection range allows ELINT operators to remain in secure standoff positions without the need to approach an emitting target. With its high spectral scan speed of up to 2500 GHz per second, this newly launched wideband processing unit is perfectly equipped to detect and process all types of low probability of intercept (LPI) radars. Integrated into ELINT systems, R&S WPU2000 delivers required information about intercepted radar emissions, including continuous raw I/Q data and measured pulse parameters. This information is vital for the characterisation of radar signals and the subsequent identification of their emitters. The ELINT receiver is able to resolve and process even complex scenarios featuring modern radar signals, including wide-band, multi-channel and high-duty-cycle radar emissions.


Photo: R & S

Rocket Centre Opened by Roketsan

(kö) The Turkish armaments company Roketsan has opened the research centre for satellite launch, space systems and advanced technologies, and explosive raw materials production. The company will continue to work on its rocket portfolio at the facilities where it carried out successful


Photo: Roketsan

tests in the past. The aim is to launch satellites developed by the company into orbit in the near future using rockets manufactured specifically for this purpose. In addition, the new facilities will produce RDX and HMX propellants for the rockets.

BrahMos Missile Developments

(yl) Tests of several modifications to the BrahMos cruise missile to extend its range are planned for 2020, one of Russia's top defence industries officials announced at the


Photo: BrahMos

ARMY-2020 Forum. India, with whom Russia developed the missile, was among the top exhibitors at the show with a strong national pavilion.In June, the BrahMos Air Launched Cruise Missile (ALCM) received the first ever fleet release clearance (FRC) issued by the certifying agency. The supersonic and advanced ALCM (designated as BrahMos-A) with its proven capabilities for the Indian Air Force (IAF), became India's first indigenous weapon to get the critical FRC. This paves the way for IAF squadrons to use the BrahMos ALCM during various combat missions, marking an important milestone for the manufacturers. The IAF gained an unmatched capability in the Indian Ocean Region (IOR) when it inducted its Sukhoi Su-30MKI armed with BrahMos ALCMs. The stand-off distance of BrahMos (300 km) and the range of Sukhoi (3000-plus km) along with refuelling, have given the IAF a great advantage during its missions in the IOR. The missile has caught the attention of countries from South America to ASEAN nations, as well as some Eastern European countries.

UK to Purchase 395 HELLFIRE Missiles

(JC Menon) The US will sell 395 Lockheed Martin built AGM-114R2 HELLFIRE missiles to the UK for an estimated cost of US$46m in a possible Foreign Military Sale which will also include technical assistance, publications, integration support and other related elements of logistics and programme support.

This proposed sale will improve the U.K's ability to meet current and future threats by replacing expiring and unserviceable missiles and maintaining capability to execute missions across a full range of military operations. Asked about any offset conditions, a State Department official, which has approved the sale, informs that the purchaser typically requests offsets. "Any offset agreement will be defined in negotiations between the purchaser and the contractor," he adds.

The HELLFIRE(R) II Modular Missile System family provides multi-mission, multi-target


Photo: Lockheed Martin

capability with precision-strike lethality and fire-and-forget survivability. It is the primary air-to-ground precision weapon for the US military as well as the armed forces of 16 other nations. The HELLFIRE family includes three precision-strike variations using a semi-active laser (SAL) seeker to home in on the target:

- The high- explosive anti-tank (HEAT) missile (AGM-114K), which defeats all known and projected armoured threats;
- The blast fragmentation missile (AGM-114M), which defeats "soft" targets such as buildings, bunkers, light-armoured vehicles and caves;
- The metal augmented charge (MAC), or "thermobaric" Hellfire (AGM-114N), which defeats enclosures and enemy personnel housed therein, with minimal collateral damage.

The fourth variant is the millimetre-wave (MMW) radar LONGBOW HELLFIRE (AGM-114L), which provides fire- and-forget and adverse weather capability. All four variants have been used successfully in Afghanistan and Iraq, with more than 1,000 missiles fired to date.

Northrop Grumman Wins ICBM Deal

(JC Menon) The U.S Air Force has awarded Northrop Grumman Corporation a US$13.3bn contract to design and build a Ground Based Strategic Deterrent (GBSD). This is part of a programme to replace its ageing MINUTEMAN III Intercontinental Ballistic Missile (ICBM) system. The Air Force Nuclear Weapons Centre announced that the effort will span eight-and-a-half years to include weapon system design, qualification, test and evaluation in

Photo: Northrop Grumman

addition to nuclear certification. Upon successful completion of Engineering and Manufacturing Development (EMD), the Northrop Grumman team will begin producing and delivering a modern and fully integrated weapon system to meet the Air Force schedule of initial operational capability by 2029. The US military operates 400 nuclear ICBMs out of 450 silos across Minot Air Force Base in North Dakota, Malmstrom Air Force Base in Montana and F.E. Warren Air Force Base in Wyoming. The EMD award follows a three-year technology maturation and risk reduction (TMRR) phase-one effort under the GBSD competition. The Northrop Grumman team has demonstrated innovation and agility by applying a digital engineering approach and has achieved all TMRR design review milestones on time and on cost. The EMD phase will be performed at the Northrop Grumman GBSD facilities in Roy and Promontory, Utah, as well as other key Northrop Grumman sites across the US The Northrop Grumman GBSD team includes:

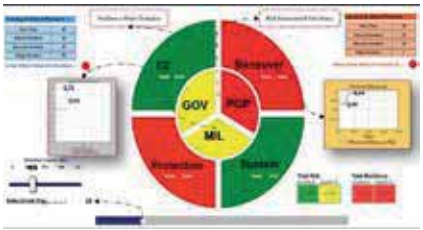
- Aerojet Rocketdyne
- Bechtel
- Clark Construction
- Collins Aerospace
- General Dynamics
- HDT Global
- Honeywell
- Kratos Defense and Security Solutions
- L3Harris
- Lockheed Martin
- Textron Systems

This is in addition to hundreds of small and medium-sized companies from across the defence, engineering and construction industries. Overall, the GBSD programme will involve over 10,000 people across the US directly working on this vital national security programme. In 2017, the Congressional Budget Office estimated that the overhaul would cost US$1.2 trillion over 30 years, including the operation and maintenance of the existing nuclear arsenal while the new technology is introduced. In 2019, the CBO estimated that the Pentagon would spend US$61bn over the subsequent 10 years on modernisation of the ICBM fleet alone.

STM Expands its Exports to NATO with ThinkTech

(jr) STM ThinkTech, Turkey's technology-based think tank, is scheduled to export its products to NATO for the third time this coming December. The contract for this third project covers the new version

Photo: STM



of the NATO Resilience Decision Support Model developed by the company to assist NATO's decision-making processes when faced with strategic shocks, such as electricity blackouts, cyber-attacks and big human movements. Within this project, which is expected to be completed in late December, STM is to develop an aggregated model that will assess the integrated resilience of eight NATO countries through open source strategic shock data. The contract for the third project related to the Resilience Decision Support Model, developed indigenously for NATO by ThinkTech was signed in August 2020. The new model, known as the NATO SHAPE Aggregated Resilience Decision Support Model, analyses the effects of large-scale complex problems in support of decision-makers, and will be used to make an integrated resilience assessment of eight countries, to be delivered to NATO on 31 December, 2020. With the developed model, the effects of different types of strategic shocks in various fields, such as energy, transportation and communication, as well as possible risks, can be analysed for specific scenarios. This entire process provides NATO with decision support to be made at a strategic level, and facilitates decision-making authorities in their choice of the steps to be taken and the measures they can take. In a Request for Information Document published by NATO Allied Command Transformation (ACT) in August 2018, solution proposals were sought related to the "assessment of NATO's resilience capacity" problem. The solution approach and methodology provided by STM was accepted by ACT, and after the first contract was signed in October 2019, the first prototype model was completed and delivered to NATO ACT. A second contract was signed with STM in February 2020 for the upgraded version of the first model, which was successfully run in a NATO-wide online workshop on 21st April 2020. For this latest model, to be developed as part of the third project, data collected from open sources regarding strategic shocks will be processed using various machine learning algorithms.

SCORPION: 2020 Contract for JAGUAR and GRIFFON

(jh) In September, Nexter, Arquus and Thales, members of the temporary grouping of companies EBMR (Engins Blindés Multi-Rôles), were notified by the French defence procurement agency (DGA) of the second production phase for the contract to build the GRIFFON and JAGUAR engines in the scope of the SCORPION programme. The DGA thus confirmed the delivery of 42 JAGUAR and 271 GRIFFON engines for the years 2022 and 2023, as scheduled in the 2019-2025 military programming law. Among the new features, this tranche includes the delivery of the first GRIFFON Artillery Observation Vehi-

cles (VOA) and GRIFFON Sanitary (SAN), which will join the Troop Transport Vehicle (TTV) and Command Post Vehicle (CPV) versions. These new deliveries will contribute to the Army's ramp-up of the SCORPION programme. The arrival of this new equipment, with the highest levels of protection and mobility, will provide users with new operational capabilities. Collaborative combat, for example, consists in connecting all the SCORPION programme's info-enhanced vehicles in real time. The firing start detectors, telemetry tools and the many sensors integrated on the GRIFFON and JAGUAR communicate together to contribute to the decision making of the vehicle commander. The JAGUAR's integrated and digitised turret and its weapons, such as the CTA40 40 mm telescopic gun, the MMP medium-range missile and the HORNET remotely-operated turrets, considerably broaden their field of action. In short, these latest-generation vehicles benefit from the latest technologies and innovations in the land-based field. The notification of this order comes in the third quarter of a year marked by the pandemic. Despite the constraints, the three companies have met their commitments, with 51 GRIFFON already delivered this year, joining the 92 GRIFFON delivered in 2019. Nexter, Arquus and Thales have made the necessary investments in the development and industrial qualification of the vehicles, and in parallel are continuing to recruit, notably engineers specialised in digital technologies.

FN Herstal and Nexter Sign Strategic Contract

(jr) FN Herstal, a Belgian subsidiary of the Herstal Group, and French group Nexter have signed a strategic contract in the framework of the Capacité Motorisée or Motorized Capability (CaMo) programme

Photo: FN Herstal

for the modernisation of the Belgian Army's ground mobility capability. This contract covers the production and delivery by FN Herstal of the latest generation deFNder® Remote Weapon Stations to be fitted to GRIFFON Multi-role Armoured Vehicles (VBMR) that will be supplied by France to the Belgian Army between 2025 and 2030. The contract between FN Herstal and Nexter, prime contractor in the French consortium in charge of the programme, results from the intergovernmental agreement of November 2018 between France and Belgium that confirmed their decision to form a long-term strategic partnership in the field of ground mobility. The contract also includes the supply to the French Army of the same type of weapon stations for its LECLERC tank modernisation programme. In the future this may lead to new opportunities derived from Nexter's international programs and for maintenance contracts. This latest success proves once again the value of the strategy of diversification and technological innovation adopted by FN Herstal for more than ten years with its Land, Air and Sea integrated weapon systems and further establishes the Company's position in high-value products using multiple technologies which create high quality employment.

NATO Forces Train with Algeria

(jr) Standing NATO Maritime Group Two (SNMG2) flagship, ESPS ALVARO DE BAZAN carried out a training programme

Photo:NATO

with the Algerian ship EL MOUDAMIR in the Mediterranean on 14 September 2020. The exercise took place after a three-day visit to the capital Algiers, aimed at increasing cooperation between NATO Maritime Command and Algeria, a member of NATO's Mediterranean Dialogue Programme. Algeria has been part of this initiative since 2000 and Standing NATO Maritime Groups regularly visit Algiers to develop military dialogue and to improve mutual understanding and promote cooperation. The ALVARO DE BAZAN visited Algiers from 12 to 14 September to focus on strengthening links between Algeria and NATO, as well as reinforcing a partnership that faces the similar threats and challenges, including terrorism and a wide variety of illegal activities across the maritime domain. The visit was scaled down due to restrictions on movement of personnel, with COVID-19 measures in force to preserve the readiness of the force. After departing Algiers, the ALVARO DE BAZAN and EL MOUDAMIR proceeded to the exercise areas. The training programme included a passing exercise as well as communications and manoeuvre drills, which are key for working together at sea and supporting collective maritime security in the region.

BLACK EAGLE 25E and 50E Unveiled

(jh) Israeli company Steadicopter, a developer of rotary unmanned aerial systems (RUAS), unveiled BLACK EAGLE 25E and BLACK EAGLE 50E - the newest models of its RUAV - now operated with electric motors, and designed for a wide range of law enforcement, maritime, civilian, and covert

Photo: Steadicopter

missions. Based on the company's BLACK EAGLE platform, the new systems enable high performance and operational flexibility for security forces and civilian applications. Converting Steadicopter's BLACK EAGLE 50 system to an electrically powered engine has significantly reduced the weight of the air vehicle, thus providing additional payload capacity. With a platform weight of 18 kg, each model has the capacity to carry additional batteries for longer flights, heavier payloads and more. The BLACK EAGLE 25E is designed for weights of up to 25 kg, making it suitable for tactical-urban missions, while meeting the strictest weight and category regulations. The BLACK EAGLE 50E, weighing up to 35 kg, enables a wide range of mission payloads, giving the user versatility for covert operations. The small dimensions of the platforms allow for efficient and safe operation. From a wide variety of OPVs to the busiest offshore platforms, the BLACK EAGLE family of products offers a comprehensive solution for highly-demanding maritime applications. All BLACK EAGLE systems are certified for use in the harshest maritime operating scenarios, according to the IP67 environmental standards.

TE-SAT 2020: an Assessment of the Current Terrorist Threat in the EU

Andreea Stoian Karadeli

2020 has developed in unexpected ways, continuously pushing beyond our comfort zones and forcing us to accept and adapt to a full set of radical changes. While new challenges have appeared and undermined the security of our world, the already existing threats and problems have not disappeared; on the contrary, they have aligned themselves to the new context.

Among them, terrorism has remained one of the burning issues requiring a re-assessment of experiences and strategies in order to be prepared for its updated form in the age of COVID-19. While terrorism is a global challenge that reflects the need for international cooperation, it also requires regional cooperation to provide solutions based on the evaluation of local contexts and dynamics.

Focusing on the EU, the main report that provides an overview of the terrorist threat every year since 2007 is produced by Europol, namely the EU Terrorism Situation and Trend Report (TE-SAT). The document addresses terrorism equally in all its forms (jihadist, ethno-nationalist and separatist, left-wing and anarchist, right-wing, single-issue) and encompasses the reported failed, foiled and completed attacks in EU Member States, as well as of terrorism-related arrests, convictions and penalties. In order to discuss and assess the findings provided by TE-SAT, this article focuses on three main elements: the current terrorist threats to EU countries and their evolution beyond the general focus on the salafi-jihadi trend, the symbiosis hidden in the terrorist puzzle within the context of the EU and policy recommendations for the future EU counterterrorism strategy.

Author

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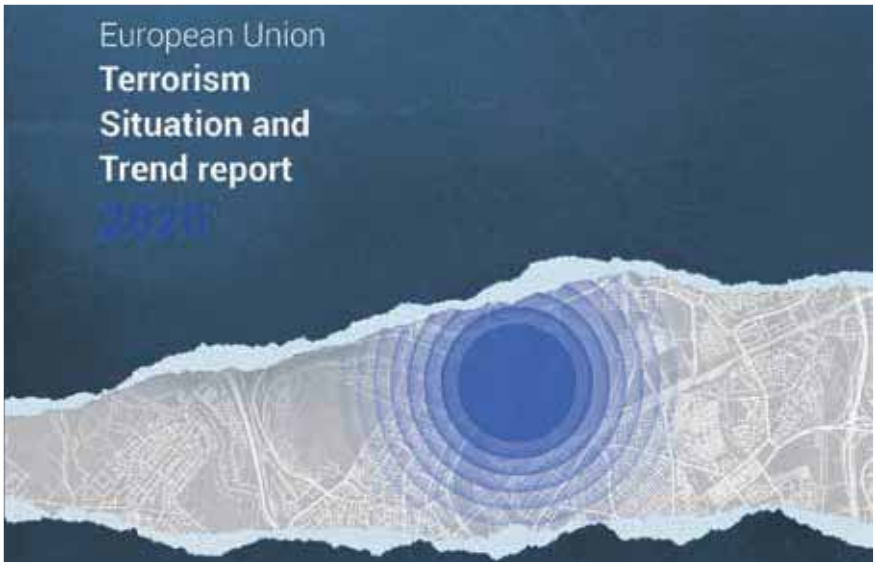
Photo: EU



The EU Terrorism Situation and Trend Report (TE-SAT). The document addresses terrorism equally in all its forms (jihadist, ethno-nationalist and separatist, left-wing and anarchist, right-wing, single-issue) and encompasses the reported failed, foiled and completed attacks in EU Member States.

Mapping the EU Terrorist Threat

From a general perspective, the number of completed, failed and foiled terrorist attacks continued to decrease in the EU in 2019 compared to the previous year. The decrease is only partially explained by the continued downward trend in ethno-nationalist and separatist terrorist attacks, as emphasized in the report. In fact, this "small victory" is also the result of an increasing international counterterrorism collaboration between EU Member States that has facilitated the necessary flow of vital intelligence in order to prevent terrorist acts. According to the data gathered by Europol, for the territory of the EU, a total of 119 completed, failed and foiled terrorist attacks in 2019 were reported by 13 EU Member States. In terms of human casualties, 10 people died because of terrorist attacks in the EU and 27 were injured. Although nearly all of the deaths and injuries were the result of jihadist attacks, 2019 has shown a reverse in the balance as the number of jihadist attacks continued to see a decrease while right-wing attacks and, in particular, left-wing attacks saw an increase. Furthermore, 1,004 individuals were arrested on suspicion of terrorism-related offences in 19 EU Member States, with Belgium, France, Italy, Spain and the UK reporting the highest numbers. The overall number of arrests decreased slightly for the second consecutive year in 2019, but the figures show that terrorism remained geographically widespread in the EU. Still, similar to previous years, the majority (362) of convictions and acquittals in EU Member States concerned jihadist terrorism.

The focus on the prosecution of jihadist terrorism, while other forms of extremism have

proved to be at least equally dangerous, reflects the terminological and legislative duality between the "alien enemy" represented by jihadist terrorism and the "enemy from within" - right-wing and left-wing terrorism. Moreover, this duality can be noticed in the terrorism related definition and legislation all around Europe, reflecting discrepancies between what constitutes terrorism among EU Member States: acts, which amount to terrorism under national legislation in one country, might not have crossed this line in another. TE-SAT's methodology, analysis and results reflect one of the hardest challenges for the creation of a comprehensive EU counterterrorism strategy: a clear distinction between terrorism and other forms of extremist violence is sometimes difficult to draw and to be agreed by all Member States.

Jihadist Terrorism

According to TE-SAT, seven jihadist terrorist attacks were carried out (completed or failed) in the EU in 2019. Twice this number of terrorist plots were thwarted by law enforcement, continuing a trend from 2018. Although the total number of jihadism related incidents in the EU decreased slightly, the jihadist network continued to be geographically widespread: among the EU Member States, eight countries suffered completed, failed or foiled jihadist terrorist attacks, the same number as in 2018. On the same note, with the previous observation regarding the increased counterterrorism cooperation between EU countries, for the second year in a row, the number of foiled jihadist plots significantly outnumbered completed and failed jihadist attacks. All but one of the seven completed or failed attacks were committed by individuals acting alone, while most foiled plots involved multiple suspects. This proves that the terrorist cells are easier to identify, while lone attackers still represent a challenge for EU security. The lone-wolf phenomenon has evolved as a threat in direct relation to the increasing use of the online environment where individuals may become inspired by propaganda material and can plan terrorist attacks based on the variety of materials available on the social platforms of those terrorist groups. These kinds of attacks are easy victories for the terrorist groups who claim them, although they have not had any direct contact with the attacker. Although intensively witnessed in the case of Salafi-Jihadi – mainly Daesh – wave of terrorist attacks after 2014, the lone-wolf phenomenon is not an element specific just to this terrorist cluster and it has been used intensively in other forms of terrorism, such as right-wing.

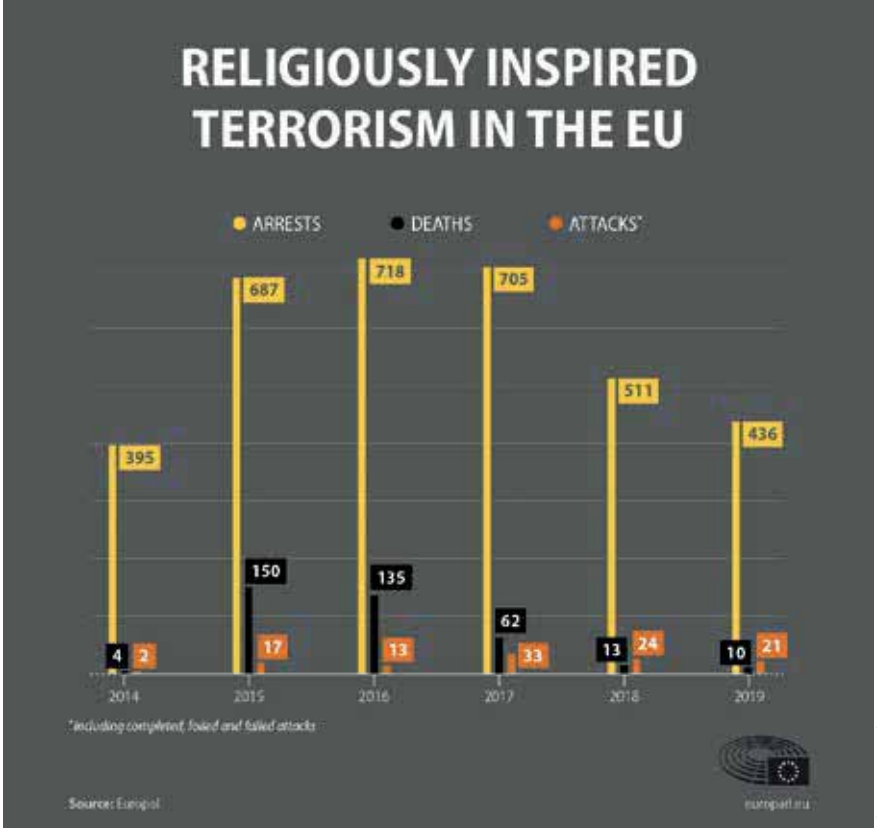


Photo: Europol

Right-Wing Terrorism

Bearing in mind that right-wing terrorism accounted for just one terrorist attack in 2018, the current data marks an increase in this phenomenon: three EU Member States reported six right-wing terrorist attacks (one completed attack in the UK, one failed attack in Lithuania and four foiled attacks in UK and Poland). Additionally, two attacks committed by right-wing extremists were reported by Germany, but under national law could not be classified as terrorism. In fact, the situation witnessed in Europe is just a part of a worldwide wave of right-wing attacks, such as those in Christchurch (New Zealand), Poway (USA), El Paso (USA), Bærum (Norway) and Halle (Germany). The perpetrators – posing as key figures of the 2019 right-wing terrorist wave – were in fact merely puppets who were part of similar transnational online communities and took inspiration from one another. As in previous years, all perpetrators motivated by right-wing ideology were male and nationals of the country in which the attack took place or was planned. As the number of attacks increased, the number of arrests attributed to right-wing terrorism decreased compared to 2018 (21 in 2019; 44 in 2018). However, EU Member States included two countries (Latvia and Lithuania) which reported right-wing arrests for the first time, proving the geographical spread of this dangerous ideology.

Ethno-Nationalist and Separatist Terrorism

Although the number decreased in 2019, attacks specified as ethno-nationalist and separatist terrorism still represented the largest proportion (57 of 119) of all terrorist attacks. According to TE-SAT data, all but one incident were related to dissident republican (DR) groups in Northern Ireland, whose activities increased. The UK reported 55 security-related incidents in Northern Ireland and one additional attack outside of Northern Ireland. The emergence of offshoot groups advocating violence, however, raised concerns in Spain and France. Furthermore, the Kurdish separatist terrorist group Partiya Karkerên Kurdistanê (PKK) continued using EU territory for propaganda, recruitment, fundraising and logistical support activities. The ethno-nationalist and separatist terrorism is based on a national/local historical/cultural/social/political context and does not transcend the borders of its own cause, as we see with Salafi-Jihadi, right-wing or left-wing terrorism.

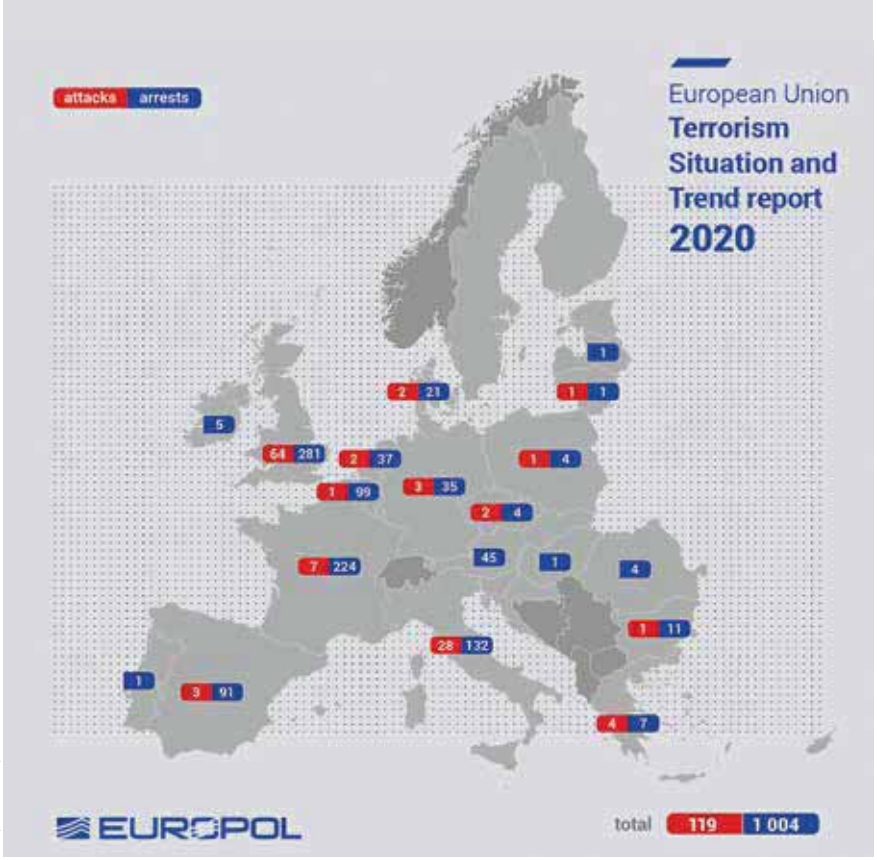
Left-Wing and Anarchist Terrorism

The left-wing and anarchist terrorist attacks witnessed an upward trend in 2019 (26) again reaching the levels seen in 2016 and 2017, after a decrease in 2018. In terms of geographical scope, Greece, Italy and Spain continued to be the epicentre of attacks carried out by left-wing and anarchist terrorists. Private enterprises, along with critical infrastructure and public/ governmental institutions were among the most frequent targets for left-wing and anarchist terrorists. In the vast majority of cases, the perpetrators remained unknown, and responsibility for the attacks was claimed online. The number of arrests on suspicion of left-wing or anarchist terrorism in 2019 more than tripled, compared to previous years. In addition, violent

left-wing and anarchist extremists continued to pose a threat to public order in a number of EU Member States. Support for Kurdish populations in Syria remained a central topic, and left-wing extremists and anarchists are believed to have travelled to join Kurdish militias in north-eastern Syria. The Turkish Marxist-Leninist terrorist organisation Devrimci Halk Kurtuluş Partisi-Cephesi (DHKP-C) continued using the EU as a logistical base to support the group's operations in Turkey.

Single-Issue Terrorism

Although not as much of a threat as the other four clusters of terrorism, single-issue extremism is still present in the EU context through a variety of activities, mostly non-violent, in which they advocate for actions against climate change and the protection of animal rights; these were carried out through peaceful protests, blockades, demonstrations, rallies and camps.



Graphic: Europol

According to the TE-SAT 2020 report, 119 terrorist attacks were reported in 2019. 1,004 individuals were arrested, 10 people were killed and 27 people were injured.

Cross-Cutting Relevant Elements in the Terrorist Symbiosis

The one-by-one short analysis of terrorist threats proves that all forms of terrorism pose a relevant risk to EU peace and security. However, single-issue terrorism is mostly non-violent and the ethno-nationalist and separatist terrorism, the most active terrorism form in Europe, is rather a national / local issue that does not transcend borders. Therefore, beyond the priority of obtaining a common EU understanding of terrorism that does not allow any dual treatment, we need to acknowledge the urge to address the increasing power of the "trinity of terrorism", as termed by the GCSP Terrorism-Joint Analysis Group's manager, Jean-Paul Rouiller. The threat represented by Salafi-Jihadi, right-wing and left-wing terrorism separately is amplified by the evolving symbiotic relationship between their representative groups. At the same time, this threat has also been amplified over time by the European focus on the "alien enemy" – the Salafi-Jihadi terrorism – and the legally packed tolerance towards the "enemy from within" – namely right-wing and left-wing terrorism.

The central element of the "trinity of terrorism" concept is the relationship that has developed between the three forms of terrorism that are seen as strategic enemies, but prove to be, in fact, rhetorical allies. They make use of each favourable context – such as political turmoil, a national / regional crisis, or a pandemic for example – to spread their violent messages, adapting their ideological reasoning to the ongoing situation. Moreover, there are also cases in which the way a certain context is used does not differ greatly between the groups, each ideological cluster becoming inspired from the other's strategy and actions. For instance, the propaganda material published by groups from all three backgrounds incite individuals to perpetrate violent acts autonomously and praise perpetrators as modern heroes, also called 'martyrs' or 'saints'. The TE-SAT reports also pointed out that, for Salafi-Jihadi, right-wing and left-wing terrorism, the greatest threat emanates from lone-actors or small cells carrying out violence on their own accord without being directed by larger organisations. In fact, this is the result of an extended online platform for extremist propaganda from various sources that incite individuals to perpetrate acts of violence autonomously and even provides the necessary operational information for these acts. Transnational extremist online communities from the trinity's ideological background celebrate perpetrators of lone-actor attacks and take advantage of their results. In fact, these kinds of attacks can be considered "easy victories" for those groups, because they do not necessitate any direct operational costs and efforts from the central structure. The perpetrators of the "trinity of terrorism" also tend to copy each other's operational strategies, using similar means and resources that proved efficient for previous attackers, irrespective of ideological background.

The conflict zones outside Europe continue to have a direct influence over the terrorism situation in the EU. Hundreds of European citizens with links to terrorist groups from different ideological backgrounds (Salafi-Jihadi, right-wing, left-wing) travelled, or supported from home, the activities of terrorist groups in countries such as Iraq, Syria and Ukraine. Since 2011, there has been strong focus on the issue of EU foreign terrorist fighters (FTF) who have travelled to Syria and Iraq to join the lately formed Daesh. However, the conflict in Syria is more complex and the Salafi-Jihadi groups are not the only ones to have received foreign terrorist fighters from Europe. Another main group, PYD/YPG, has welcomed three main types of foreign fighters: non-Syrian Kurds, far-left and far-right individuals from the West, who are known to be in Syria for "the fight against Islam". It is very hard to determine the ideology that has the strongest influence, although rumours from the ground tend to lean towards the left-wing. However, the existence of both right-wing and left-wing foreign terrorist fighters from EU Member States in Syria and Iraq prove that all extreme ideologies can find common ground to reflect their own justifications of truth in any conflict zone. A very similar situation is identified in the case of the conflict in Ukraine where both right-wing and left-wing groups from EU countries have become an important source of foreign terrorist fighters that have been travelling constantly. This is, in fact, a long-term challenge for the EU and its Members States.

The prison radicalisation element is also an important detail on the map of terrorist

threats in EU countries. According to TE-SAT, EU Member States reported that individuals imprisoned for terrorist offences and prisoners who radicalise in prison pose a threat both during their imprisonment and after their release. So far, the cases identified in the report are related to Salafi-Jihadi terrorism: France reported that more than 500 terrorist convicts are in French prisons alongside 900 radicalised individuals; a total of four attacks were foiled between mid-2018 and the end of 2019. Spain reported five inmates who formed a Jihadist cell among prisoners in two prisons, while a high percentage of incarcerated non-terrorist offenders were radicalised by Jihadist ideology. Belgium acknowledged that over 200 people were being formally monitored in prison in 2019 on account of their radicalisation and the Netherlands is concerned that Jihadists in prison have the potential to create new networks which may strengthen the Jihadist community following their release or give rise to jihadist networks abroad that pose a threat to the Netherlands. Although the focus has been on the Salafi-Jihadi radicalisation, the probability for the right-wing or left-wing extremism to succeed in gaining more recruits is high in all European prisons. The reason behind this claim is based on the fact that prisons offer a perfect environment for any kind of extreme views and the narrative of alienation and grievance finds a fertile soil to grow and develop. In this toxic environment of hyper-magnified emotion, danger and frustration, new and malign identities are offered and accepted. Many of the young white men in prison – who make up the vast majority — come from the same places and have the same life experiences as those now intellectualising the far-right.

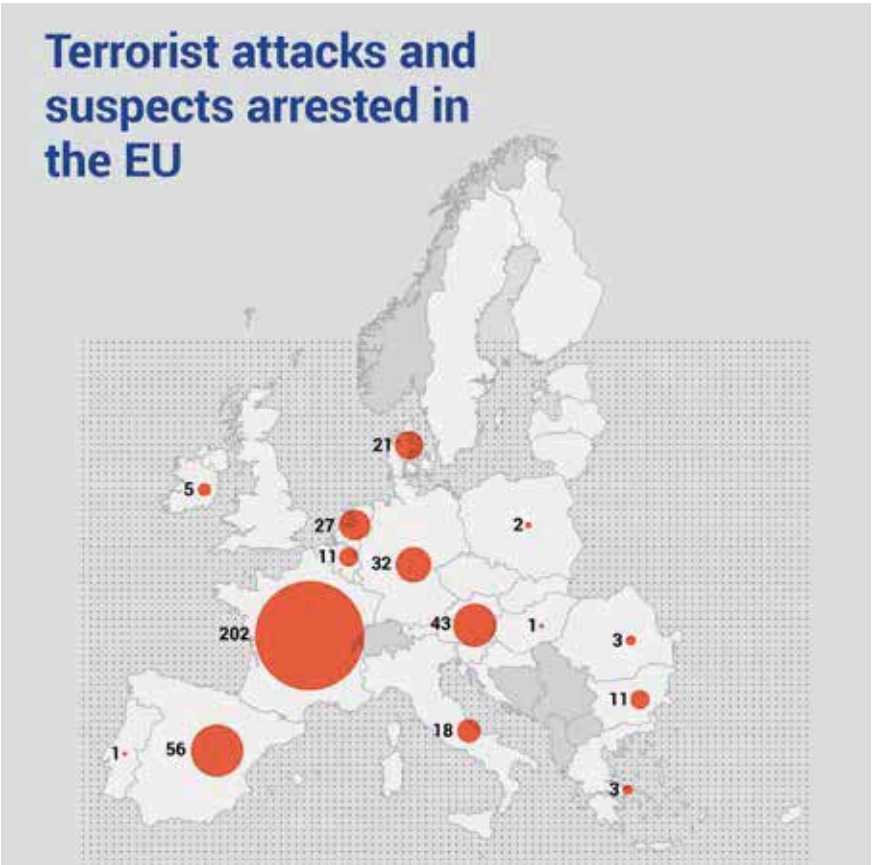
Another cross-cutting element in the terrorist puzzle for EU Member States (that can also be witnessed beyond the borders of Europe), is the element of "criminal background" or the so-called "nexus" between crime and terrorism. Although the TE-SAT report argues that there is little evidence to support this hypothesis, it agrees that criminals and terrorists coexist in certain marginalised areas, within the same family structures or in prison, thereby enabling contacts and transaction-based cooperation. According to my database of Daesh attacks in Europe since 2014 until the current day, more than half of the attacks were committed by perpetrators with a criminal past (35 out of 45), while 22 of them had spent time in prison. In fact, certain criminals are attractive recruits for terrorist groups and prisons in which radicalised inmates and criminals live together are of concern. It is important to mention that holding a prior criminal record is a common characteristic for a high proportion of foreign terrorist fighters that have joined Salafi-Jihadi, right-wing and left-wing terrorist groups in various conflict zones.

The Future of the EU's Counterterrorism Strategy

Firstly, as emphasised by the TE-SAT report, despite the common legal framework embodied by EU Directive 2017/541, discrepancies between what constitutes terrorism persist among EU Member States. At the same time, the analysis shows that all EU Member States face similar challenges in defining the line between violent behaviour and terrorism. Therefore, increased law enforcement cooperation and harmonisation of terrorism legislation and jurisprudence among EU Member States will contribute to consolidating the EU's area of freedom, security and justice and will provide the foundation for a comprehensive counterterrorism agenda.

Secondly, the EU and its Member States should address two main "time-bombs" that are threatening their security in the short, medium and long term: the FTF prisons and family camps in Syria and the increasing radicalisation in European prisons. Regardless of the location, individuals prone to criminal activities, including those currently imprisoned, who radicalise to violence and engage in terrorism, represent a serious long-term security threat that demands a rapid development of current tools and methods. While the FTF radicalisation pool sets the stage for history to repeat itself, as it happened in the case of Daesh's "Breaking Walls" operation, the women's and children's camps are, ironically, a guarantee for the next wave of salafi-jihadism. For this reason, the common effort towards the harmonisation of terrorism legislation and jurisprudence among EU Member States is needed in order to provide effective solutions for the "full-package" repatriation of EU citizens and their families. In this regard, the legislation should be adopted to ensure the fair trial for the FTFs and a rehabilitation process for their families (especially for children). The prison radicalisation within the EU is also a pressing issue that can only be effectively tackled through a multidisciplinary perspective which provides a better understanding of radicalisation factors and dynamics while correlating them with the matching characteristics identified in the prisons environment.

Thirdly, the current pandemic has provided the social and psychological factors that facilitate the extremist narrative, regardless of ideological background. The virus per se, has provided terrorist groups not only a perfect medium in which to develop their propaganda and recruit or motivate extensively, but it has also presented an opportunity for future attacks. Although we are not yet aware of what our societies will become in the post-Covid world, we still need to adapt faster to the evolving context, an ability that terrorist groups have proved to have for a long time. Once again, the harmonisation of EU Member States' legislation and jurisprudence regarding terrorism is vital for developing the right strategies to defeat the terrorist threat during and after the pandemic. Still, the first step remains the hardest: denouncing the terminological duality and the lack of courage to call a terrorist what he/she really is, beyond their ideology. ■



Graphic: Europol

Security Challenges in the COVID-19 Epoch: The Case of Armenia

Gayane Novikova

Since February 2020, the Armenian state and society have been dealing with an aggravating public health crisis and growing economic and social risks. A sharp economic decline in the course of the COVID-19 pandemic is unavoidable.

Although internal challenges stem from a gradually worsening economic situation; however, several issues specific to Armenia should be mentioned.

Internal Challenges

The post-revolutionary Armenian government has been simultaneously introducing and implementing a variety of economic, political, and legal reforms and actions. Many affect the interests of former corrupt political and economic elites. Moreover, some of the economic reforms are not popular among those strata expecting quick and significant changes in their lives. Thus, the anger of the "formers" has coincided with disappointment by that segment of Prime Minister Pashinyan's supporters who demand more radical measures.

The pandemic became a catalyst. Forces close to former presidents R. Kocharyan (who is on trial for "overthrowing the constitutional order" in March 2008) and S. Sargsyan (charged with embezzlement of public funds) are still able to manipulate some segments of society through a large net of media sources and to a certain extent to sabotage measures taken by the government in many important spheres of public life. In particular, an anti-governmental campaign unleashed through media controlled by the opposition (with close ties to Russian economic and political circles) at the initial stage vigorously criticized measures taken by the authorities to prevent the spread of the virus, and later – a slow reopening of the economy.

A serious split has occurred in the Parliament. Taking advantage of the difficulties facing Pashinyan's cabinet, the largest parliamentary oppositional party "Prosperous Armenia" led by Armenia's second wealthiest businessman, G. Tsarukyan, began in early June to question the very competence of the government and demanded its resignation. This va banque move by Tsarukyan was likely provoked by an investigation opened against him in February. The parliamentary majority, represented only by members of the ruling "My Step" fraction, voted unanimously to deprive Tsarukyan of his parliamentary immunity and to allow his arrest on suspicion of electoral fraud (was arrested on 25 September, and was sentenced for two months). Two oppositional parties – Prosperous Armenia and Bright Armenia – boycotted this vote and demanded on 2 July an investigation of the government's response to COVID-19. A special parliamentary commission will be established in September. However, further developments indicate that Tsarukyan is seeking a compromise with the authorities, and trying simultaneously to establish a coalition with non-parliamentary oppositional forces.

Photo: Ilgar Jafarov

Azerbaijani refugees fleeing from Kalbajar in Nagornyi Karabakh in 1993

Armenia's internal dynamics intertwine to some extent with its external challenges. Wishing to avoid complications with Russia, Pashinyan's government announced that it will implement a balanced foreign policy, therefore no shifts will occur in the Armenian-Russian strategic partnership.

Owing to the activity of previous governments, Russia has gained almost full control over major strategic sectors of Armenia's economy. Influenced by Western sanctions and the coronavirus, the Russian government is using all possible leverage to minimise damage to its economy at the expense of its international partners. For Armenia this posture has resulted, among other developments, in an increase in the gas price, a sharply reduced flow of remittances from Armenian labor migrants, and in disputes centring on the Armenian branch of the South Caucasus Railway. Several former high-ranking Armenian officials, together with a number of oligarchs fleeing criminal charges in Armenia, have found refuge in Russia. However,

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despite some signs of bilateral tensions and disagreements, most important for the moment is a deepening of the Armenian-Russian military partnership.

Serious External Challenge

Further challenges are rooted in the unresolved Nagorniy Karabakh conflict. Immediately after the Parliamentary elections of December 2018, the "Inquiry Committee for Examining the Circumstances of the Military Activities of April 2016" was established. Its findings and conclusions regarding the four-day war in April 2016 will be presented in September of 2020. This document, together with a newly adopted National Security Strategy, is of extreme importance owing to the serious shifts which have occurred in the Armenian security system and in the course of the Nagorniy Karabakh conflict negotiations since April 2020.

It should be emphasised that the Nagorniy Karabakh conflict was in its lowest intensity stage in the period from the autumn of 2018 until the spring of 2020. Both Armenia and Azerbaijan were focused mainly on their domestic problems and were imitating a continuity of the negotiations. In the meantime, activities of Russian diplomats regarding the resolution of this conflict became more pronounced. Remarks on 21 April 2020 by the Russian Minister of Foreign Affairs, Sergey Lavrov which indicated a tiny shift toward the Azerbaijani position were met with strong criticism from the Armenian side, and with appreciation from the Azerbaijani side.

Moreover, the Azerbaijani authorities – facing serious economic and political problems at home – attempted to direct the simmering internal tension toward the external enemies – namely, the Republic of Artsakh and Republic of Armenia. A significant alteration in Azerbaijan's modus operandi must be indicated: Armenia has become a target. In particular, on 13 May, Azerbaijani military forces attacked a civilian object in the village of Berkaber in Armenia's Tavush Province. On 12 July, the Azerbaijani side attacked an Armenian military position in the same province, and the next two days its artillery shelled the Armenian town Berd. The Azerbaijani army used also a tank and dozens of drones, including an Israeli-made Hermes 900 surveillance UAS (Unmanned Aircraft System). The latter, together with 13 drones, was shot down by the Armenian side.

A serious threat of escalation of the conflict with the involvement of external actors occurred for the first time since an officially-signed ceasefire on the Nagorniy Karabakh conflict in May 1994:

- The recent clashes occurred within the internationally recognized borders of the Republic of Armenia;
- On 17 July, the Azerbaijani side openly threatened to attack the Metsamor Nuclear Power Plant, located 36 km west of Yerevan; this statement should be evaluated as state-supported terrorism.
- On the same day, Turkey (which is a member of the OCSE Minsk Group on the Nagorniy Karabakh conflict resolution) announced its readiness to provide full military support to Azerbaijan.
- Russia, the USA, the EU, and NATO called for a ceasefire and a resumption of the negotiations.

The situation along the Armenian-Azerbaijani state border was stabilised after 6-7 days; however, there is no certainty regarding a resumption of negotiations within the OSCE Minsk Group format. Nonetheless, these small-scale and local military clashes have serious implications for all parties involved.

Photo: Julian NYca

A war-torn building in Shusha, Nagornyi Karabakh

The Implications for Armenia

- Given present circumstances, the ongoing internal tensions of different intensity in Armenia will be marked by a further consolidation of the ruling elite and its political supporters. The opposition will also try to consolidate its forces before the next parliamentary elections in 2023, seeking to present all broad-ranging negative effects of the pandemic as a failure exclusively of the Pashinyan government.
- A further deterioration of the Armenian-Russian relationship cannot be excluded. However, both sides need each other more than ever. They will seek to minimise the possible consequences of any disagreement through mutual concessions.
- The security and defence of Armenia and the Republic of Artsakh remain a top priority for Armenia. A growing militarization of the South Caucasus. An arms race between Armenia and Azerbaijan will demand from Armenia a defence budget increase.
- The recent escalation along the Armenian-Azerbaijani border has indicated a possible transformation of the Nagorniy Karabakh conflict into an international one owing to a series of factors. Prevention of a spillover of this conflict beyond its current borders must be a priority: The international community should strongly condemn any attacks on Armenian civilian targets by Azerbaijan, support the resumption of negotiations as the only possible option for the resolution of the conflict, and an immediate implementation of the agreements regarding an improvement of monitoring along the Line of Contact between Azerbaijan and Republic of Artsakh.
- The Azerbaijani government has been cultivating anti-Armenian sentiments in Azerbaijani society for more than three decades; however, a new phenomenon has occurred. The events on July 2020 sparked interethnic Armenian-Azerbaijani collisions in the Diasporas. Aggressive actions of the groups of Azerbaijanis were organised by the Azerbaijani embassies in several states, in particular in Russia, the US, Germany, Ukraine, and were directed against Armenians living in these countries.

A Risky Border Stand-off in the Himalayas

Suman Sharma

Although the situation currently appears to be calming down again somewhat, the Shanghai Cooperation Organisation tries to provide a platform for a meeting of the Indian and Chinese Defence Ministers amid the ongoing border dispute.

Chinese military strategist Sun Tzu in his military treatise 'The Art of War' wrote, "When you surround an army, leave an outlet free. Do not press a desperate foe too hard."

After repeated requests from the Chinese Defence Ministry, for the first time during the four-month long Indo-China border impasse, the Indian Defence Minister agreed to a meeting with his Chinese counterpart. The opportunity presented itself in Moscow on 5 September in the margins of the Shanghai Cooperation Organisation (SCO) ministerial meeting of the eight-nation bloc.

Notwithstanding dialogue being pursued at various levels, including by local military commanders, and with the diplomatic machinery also in action, the defence ministers of both countries had not spoken since the Himalayan border stand-off began between these two nuclear neighbours in May.

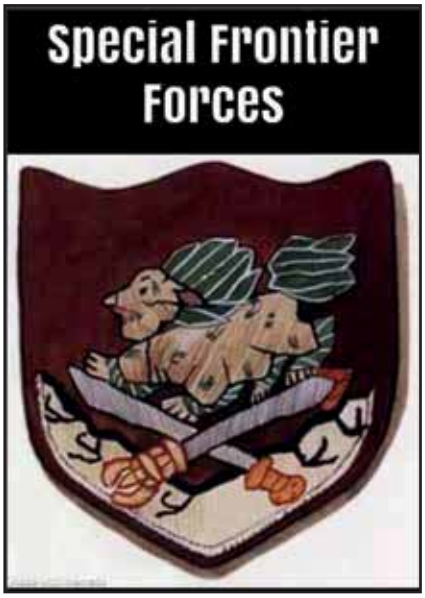
The all-important meeting between Indian Defence Minister Rajnath Singh and his Chinese counterpart, General Wei Fenghe, was inconclusive and ended without a joint statement. Both nations displayed aggressive posturing with each side blaming the other in separate statements instead.

The Indian statement read, "Actions of the Chinese troops, including amassing of [a] large number of troops, their aggressive behaviour and attempts to unilaterally alter the status quo were in violation of the bilateral agreements, there should be no doubt about our determination to protect India's sovereignty and territorial integrity."

In turn, Beijing blamed New Delhi in their statement, "The Indian side is entirely responsible. Not an inch of China's territory shall be lost. The Chinese military is absolutely determined, capable and confident in safeguarding national sovereignty and territorial integrity."

The hard posturing in Beijing's statement echoes Chairman Mao Zedong's comments made during the 1962 Indo-China conflict when he said that, "Nehru wants to move forward and we won't let him. Originally, we tried to guard against this, but now it seems we cannot prevent it. If he wants to advance, we might as well adopt armed coexistence. You wave a gun, and I'll wave a gun." He even drew a parallel with former Indian PM Nehru's 'Forward Policy' to a strategic advance in Chinese chess. Remembering how the 1962 war began, Jayadev Ranade, former Additional Secretary in the Cabinet Secretariat, added "Chinese Premier Zhou Enlai visited India two-three times before the 1962 war. Post 1955, as Sino-Soviet relations were deteriorating, Enlai's overtures about a possible boundary deal were rejected by Nehru probably because it represented more of a zero sum game."

Photos: via author



The SFF is India's most secret force.

Beijing has obviously felt that a defence ministerial dialogue was necessary after the Indian Army captured all tactical heights in this part of the Himalayan range, including 'Helmet Top' and 'Black Top' (areas on the Indian side of the Line of Actual Control (LAC) which witnessed intense fighting during the 1962 Indo-China War, after carrying out a preemptive nighttime strike on Chinese troops on 29-30 August.

Briefing the lower house of Parliament, Defence Minister Singh stated on 15 September, "The situation this year is very different both in terms of scale of troops involved and the number of friction points, As of now, the Chinese side has mobilised a large number of troops and armaments along the LAC as well as in the depth areas. There are several friction areas in Eastern Ladakh including [the] North and South Banks of the Pangong Lake."

There exist five border agreements between China and India, based on which both nations have held 22 rounds of special representative talks - all without any positive results. India and China both emerged at around the same time as free nations and share common episodes of mutual support during their respective freedom struggles. One compelling instance dates back to 1939 during the second Sino-Japanese war. At Mao Zedong's direct request to Jawaharlal Nehru, President of the Indian National Congress, a team of five Indian doctors were sent from India to help wounded Chinese soldiers fighting the War of Resistance against Japanese aggression. Among them was 28-year old Dr. D.S. Kotnis from the southwestern Indian state of Maharashtra who joined the Eighth Route Army (led by Mao Zedong) and worked for almost five years in mobile clinics saving hundreds of lives before he died there in 1942.

The primary aspect of this assistance mission was that of a nation under occupation offering a helping hand to another occupied nation, something that was further reinforced by Nehru's China visit in 1939. Following Kotnis' death, Mao Zedong personally wrote to his family in India, and a memorial hall was built in China as a tribute.

The Shanghai Cooperation Organisation

This is not the first time that the SCO has provided the stage for India to meet other nations to iron out differences and disagreements. Multilateral platforms such as the SCO, BRICS, and RIC have all been used by India to meet foreign leaders on the sidelines in order to discuss outstanding issues.

At the height of the 73-day long Indo-China Doklam stand-off, Indian Prime Minister Narendra Modi and Chinese President Xi Jinping, met in the margins of the Astana SCO Summit in 2017, the year when India and Pakistan became full members of the Organisation. While bilateral meetings on the sidelines were welcomed, it was decided in Astana that the forum would not be used for resolving bilateral issues and that disagreements should not be allowed to become disputes. This sentiment was echoed in the joint statement of the Foreign Ministers of India and China who also met on the sidelines of the Moscow SCO meeting in early September. Their five-point joint statement was more toned down with emphasis placed on "Concluding new Confidence Building Measures to maintain and enhance peace and tranquillity in the border areas."

In 2015, with Observer status at the SCO, Indian Prime Minister Modi met his Pakistani counterpart Nawaz Sharif and Iranian President Hassan Rouhani on the sidelines.

Former Indian Ambassador to Kazakhstan Ashok Sajjanhar says, "the SCO was a good opportunity for both sides to express their views. India stood face-to-face before China conveying that India is firm and strong on its territorial integrity and sovereignty."

There are, however, conflicting views about Indian membership of the SCO, as Jayadev Ranade explains, "The question to be asked is whether SCO is a useful platform? There isn't much for India to benefit from by being in SCO, as most countries in it are unfriendly to India, except Russia and the Central Asian Republics and the CARs are not very significant in the Organisation of Islamic Cooperation (OIC) - the flagship grouping of the 56 Islamic nations of the world."

India, having assumed the presidency of SCO this year, is all set to host the Heads of Government meeting in New Delhi on 30 November, where a Xi-Modi bilateral on the sidelines is very much a possibility.

Iran

Iran is one of the four Observer states interested in full membership of the SCO and interestingly, the Indian defence and foreign ministers both made a stopover in Tehran on the way to and from Moscow. Iran holds special strategic importance for India but an over-arching Chinese shadow has been cast on the Indo-Iranian relationship. Beijing is interested in signing a major port development project on the Strait of Hormuz and this comes at a time when India is struggling to complete the second phase of the Chabahar Port project due to stringent American sanctions imposed on Iran. The second phase includes a rail link, which will connect India to Central Asia.

New Delhi is also perturbed about an alleged alliance proposed by Iran recently, which includes China, Turkey, Russia and Pakistan. The alliance is fast taking shape and the countries may soon make an announcement.

India`s Special Frontier Force relies on soldiers from the region`s ethnic minorities.

An ethnic Tibetan, soldier Nyima Tenzin (centre, standing) lost his life in the Indo-Chinese border scuffle during the night of 29th August 2020.

The Special Frontier Force

The Indian Army's covert force - the Special Frontier Force (SFF) - came to light recently after an SFF soldier, Nyima Tenzin, reportedly died after stepping on a land mine laid by the Chinese PLA at the border, during the late-night scuffle on 29 August between the two sides.

The deeply secretive SFF was formed after India's humiliating defeat at the hands of the Chinese in the 1962 war. The backbone of the force are Tibetan recruits whose families fled Tibet after the Chinese invasion and occupation in 1959 leading to the Dalai Lama seeking refuge in India. Based in Chakrata in the north Indian state of Uttarakhand, SFF recruits from the various Tibetan refugee settlements in India and is known to employ guerrilla tactics.

The SFF, which also goes by the names Establishment 22 or 'Vikas Battalion', functions under India's external intelligence agency – the Research and Analysis Wing – under the Home Ministry and is said to have played an important role in the 1971 Bangladesh Liberation War. ■

Modernisation of the Czech Armed Forces

Michał Jarocki

The Czech Armed Forces are in the middle of an overall modernisation, which will transform them into a highly efficient fighting force, capable of conducting combat operations and supporting allied troops on the future battlefield.

At the very core of this modernisation process is the replacement of obsolete, Soviet-era military equipment, a legacy of the Cold War, with modern, multipurpose and modular weapon systems, which will provide Czech troops with all the tools they need to secure the country's safety and prosperity. The ambition of the Czech Ministry of Defence (MoD) is to significantly enhance the capabilities of the Czech Armed Forces (Armáda České republiky, AČR) by 2030. According to the current vision, by that time, AČR's operational and combat capabilities should reach NATO-required standards. The Armed Forces should gain the capability to confront a wide range of threats which could be met on future battlefields, as well as to be able to fulfil its international obligations, such as participation in multinational military operations.

By the time the modernisation project is completed, AČR will distinguish itself by enhanced mobility, efficiency, durability, deployability, sustainability, flexibility and interoperability. Furthermore, it should become a highly operational fighting force, with a balanced organisational structure, modern and operationally capable equipment and fully trained personnel.

One of the ways to meet this modernisation goal is through the constant enhancement of the country's defence budget. In early 2020, the Czech MoD announced its intention to significantly increase defence spending. The department would like to see around a quarter of its budget invested in the procurement of newly acquired - or the modernisation of currently operated - military equipment.

The MoD has a more specific goal of strengthening the Czech Army through the enhancement of its operational capabilities and combat strength of field units. Therefore, the department has decided to allocate €2.7Bn for the country's defence expenditure, which roughly represents a 13% increase on the previous year.

The department also intends to spend around €653M on the procurement of new military equipment or the modernisation of currently operated weapon systems. "The goal is to modernise and strengthen our Army," Lubomír Metnar, Minister of Defence of the Czech Republic said in early 2020. "Modernisation of the Army is my absolute priority. We are doing our utmost to ensure that our troops have the best equipment available."

Czech Army Awaits New IFVs

For the past several years, one of the largest and most costly procurement programmes of the Czech Armed Forces was the planned acquisition of 210 new tracked infantry fighting vehicles (IFV). The aim is to replace the currently operated, obsolete Soviet-era BVP-2s, which are no longer capable of operating on the modern battlefield and do not provide the sufficient level of protection, either active or passive, but instead constitute a threat to the security of their crews. The project has an estimated value of about €1.8Bn.

The new vehicles will be operated by the Czech Army's 7th Mechanised Brigade which is currently equipped with obsolete BVP-2s and modernised T-72M4CZ MBTs. Three manufacturers have expressed interest in the Czech IFV programme and have submitted their bids in late 2019. This includes General Dynamics European Land Systems (ASCOD 2), BAE Systems (CV90) and Rheinmetall Landsysteme (LYNX KF41). Another company, which initially planned to participate in the programme, the German Projekt System & Management GmbH,

Photo: Rheinmetall

The LYNX KF41 from Rheinmetall Defence is one of the front-runners in the Czech programme for new infantry fighting vehicles.

a JV between Krauss-Maffei Wegmann and Rheinmetall Landsysteme GmbH, eventually decided not to make an offer.

Since the planned procurement of new IFVs is one of the biggest modernisation programmes in the recent history of the Czech Armed Forces, the country expects that its finalisation will bring significant benefits to the local defence industry.

As all three bidding companies have already expressed their readiness to move the production of new IFVs directly to the Czech Republic, local manufacturers could become involved in the production, testing and delivery of new combat vehicles.

The German IFV Offer

Since the beginning of the Czech procurement programmes, the German company Rheinmetall Defence is considered to be one of the front-runners. This is largely because the company has played a significant role in the Czech Republic's defence market for many years now, and has invested a significant amount of its time and resources in establishing a stable and flourishing cooperation with local partners.

Furthermore, Rheinmetall's LYNX KF41 IFV is considered to be one of only a few modern combat platforms ready to meet the Czech Army's high operational requirements, which from the very outset was designed as a modular vehicle. As a result, the LYNX could be fitted with various mission kits and survivability packages, which will not compromise its level of mobility.

The vehicle offered for the Czech Republic features a highly efficient propulsion system, comprises of an 850 kW (1140hp) Liebherr engine and a proven Renk transmission. The platform has a high power-to-weight ratio of 26 hp/t with a gross vehicle weight of approximately 44 tonnes.

The LYNX KF41 IFV is fitted with the Lance 2.0 turret which is integrated with the new Wotan 35 electrically driven cannon fitted with the company's proven and in-service 35x228mm ammunition family. The turret could also be fitted with a dual Rafael SPIKE LR2 anti-tank guided missile system, non-line of sight strike loitering munitions, UAVs or an electronic warfare package.

The vehicle's main armament is supported by secondary weapon systems and highly efficient passive and reactive self-protection systems, which help in defeating rocket-propelled grenades and anti-tank guided missiles. As a result, the vehicle is suited for peer-on-peer combat. The LYNX KF41 IFV can be deployed in a wide array of operations, from peacekeeping to high-intensity, conventional warfare.

GDELS as One of the Front-Runners

GDELS, one of the major armoured vehicle manufacturers in Europe, is offering its ASCOD 2 platform in the Czech programme. The vehicle has already been selected by the armed forces of Austria, the UK and Spain in the ULAN, AJAX and PIZARRO programmes.

The offer submitted for the new Czech IFV was customised in accordance with the requirements of the future operator. Consequently, the ASCOD vehicle is expected to feature a number of improvements to its design, enhancing its operational capabilities and making it ready to operate on the potential Central and Eastern European battlefield.

ASCOD 2 for the Czech Republic will be coupled with a selected turret system. During the IDET 2019 exhibition held in Brno, GDELS presented two potential solutions for the Czech ASCOD's turret: the unmanned UT30MK2 from Israeli Elbit Systems or the manned MT30.

However, despite having presented two Israeli turret systems in Brno, the manufacturer admits that it is ready to integrate any

Photos: Michał Jarocki (6)

The ASCOD2 platform from GDELS was customised in accordance with the requirements of the Czech Armed Forces. As a result, the vehicle features a number of enhancements to its operational and combat capabilities.

kind of manned or unmanned turret with the future Czech ASCOD vehicle. Its final configuration will depend solely on the demands of the Czech customer.

GDELS also makes a strong point about the industrial component of its offer, as the manufacturer is open to establishing extensive cooperation with the local defence industry on the production and delivery of new IFVs. According to the manufacturer, as a result of this potential cooperation, Czech defence companies could be added to GDELS' global chain of suppliers and subcontractors, allowing them to offer their products globally and improve sales opportunities.

An Uncertain Future

In the Spring of this year, thanks to the COVID-19 pandemic and the anticipated economic crisis, the Czech government announced that it considers putting the IVF programme on hold, either by postponing it or, which seems rather less likely, cancelling it altogether. The Czech Prime Minister, Andrej Babiš, explained that the country had to transfer its budget fund to other, more urgent projects, such as health care and crisis management. "The Army can wait. We probably do not need infantry fighting vehicles immediately, but we need other things for this coronavirus war," Babiš said.

Due to unexpected circumstances, the prospect of delaying the IFV tender places the Czech Army in a difficult situation. Postponement of the selection of the new combat vehicle could leave the Army with the currently operated, but obsolete BVP-2, and a further degradation of the country's defence capabilities.

The postponement of the IFV tender also puts the bidding companies in a difficult situation, as they have already spent significant resources on the promotion of their products and preparing the groundwork for future cooperation with the local defence industry. However, each of the interested parties already declared their understanding of the current situation and will maintain interest in the ongoing selection process.

"Rheinmetall views the Czech Republic as a key market and will continue to invest and partner with Czech companies for the foreseeable future. We will fully respect the decisions of the Czech Ministry of Defence and comply accordingly," said Oliver Mittelsdorf, a senior VP in Rheinmetall's Vehicle Systems Division.

He continued by saying that "Rheinmetall is working closely with the Czech MoD and will do their utmost to meet their requirements of today and tomorrow. Rheinmetall will always remain open, transparent and flexible to the Czech government's future defence, technology and automotive needs."

"Our strategy has always been one of long-term investment in the Czech Republic with local defence partners. We do not foresee any changes in our commitment to working with the Czech defence industry and our plans have not altered one bit," Mittelsdorf added.

ASCOD 2 for the Czech Republic could be fitted with UT-30MK2 unmanned or MT30 manned turrets from Elbit Systems. GDELS assures, that the IFV will be compatible with any type of turret system selected by the future operator.

Short/Medium Range AMD Systems

The Czech MoD has recently announced its intention to procure the Israeli short and medium range SPYDER (Surface-to-air PYthon and DERby) air-and-missile defence system from Rafael Advanced Defense Systems and Israel Aerospace Industries (IAI). New AMD systems will replace the currently operated, obsolete, Soviet-era 2K12 KUB systems. Israeli SPYDER AMD systems are said to be effective against a wide range of modern air threats, such as enemy aircraft, helicopters, drones and missiles.

"Anti-aircraft missile systems, together with supersonic aircraft, form the basic pillars of air defence. Therefore, the acquisition of a new generation of an anti-aircraft missile system, capable of countering current air threats, is a key strategic defence project and one of the main priorities of the ongoing modernisation of the ACR,' said Lubomír Metnar, Czech Minister of Defence.

The Czech Army has a requirement for four short/medium range AMD batteries, each equipped with its own 3D radar, fire command and control system, and four launchers. Elements of the SPYDER-based AMD system will most likely be fitted on

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BAE Systems bids its combat proven and tested CV90 IFV platform in response to the Czech requirement

Photo: JCD

John Cockerill Defense recently unveiled its CPWS Gen II turret, intergated on the Milrem Type X vehicle. Cockerill offer a compelling turret solution for European armoured vehicles.

the Tatra 815-7 8×8 chassis and will have a high level of air transportability, able to fit into C-130 Hercules, C-17 Globemaster III or Airbus A400M transport aircraft.

The Czech MoD estimates that the procurement of a modern AMD system will cost as much as CZK 10Bn (€369M). Currently, it is expected that the government-to-government agreement could be signed as early as the beginning of 2021, with first deliveries commencing from 2023.

According to the Czech MoD, the local defence industry will play a decisive role in implementing the Israeli AMD systems into service. The Czech Government requires that at least 30% cost of the programme will be spent locally. Furthermore, the Czechs also wish that a local entity, either one of the already existing, or a new joint venture, will be responsible for maintenance, repairs and modernisation of the new AMD system throughout its whole service life.

SPYDER short/medium range AMD batteries should be compatible with IAI Elta ELM-2084 3D multi-mission radars (MMR), which the Czech MoD procured from Israel in late 2019. Under the terms of this agreement, which has a value of $125M, deliveries should commence in 2021 and conclude by 2023.

Czech Republic Intends to Procure CAESAR SPHs

In June 2020, Defence Minister Metnar announced that his Ministry intends to procure 52 155 mm CAESAR self-propelled howitzers from the French company Nexter. According to the Minister, the contract for delivery of the new SPHs could be signed by the end of the year. The local defence industry might play a decisive role in the project, with at least 40% involvement envisaged in the manufacturing process.

French 155 mm CAESAR SPHs are also expected to replace the currently operated, Soviet-era 152 mm DANA howitzers, whose operational capabilities have diminished due to their obsolescence and not meeting requirements of the future battlefield.

"[Our] soldiers can look forward to these new weapon systems. Our Army needs new howitzers. It is one of the four current strategic modernisation projects. DANA howitzers are 40 years old and have half the range of NATO's standard howitzer," Minister Metnar stated.

A total of eight different SPH systems have been evaluated by the Czech MoD during its market research and feasibility studies. "Based on the results, military experts clearly preferred the acquisition of 52 CAESAR SPHs from the French manufacturer Nexter. The MoD therefore decided to start negotiations with the manufacturer so that the contract could be concluded later this year, addeds Metnar.

According to the Chief of the General Staff of the Czech Armed Forces, Army General Aleš Opata, the most important

The Czech MoD has recently decided to conduct a repair and modification programme for the fleet of obsolete, Soviet-era T-72M4CZ main battle tanks. The local VOP CZ will be responsible for execution of the programme.

Encrypted communication is essential for securing data

Eavesdropping on smartphones and hacking of messages and files is easier and more widespread than most companies think. Smartphone security is still an overlooked area in many businesses. Often, companies only recognize the need to secure their phones after a data breach has been discovered. That is, if the breach is discovered at all. "There is a huge dark figure. Companies do not necessarily know if and when their communication was intercepted," says Hans Hasselby-Andersen, CEO of Dencrypt. "The intercepted data may be used discreetly, so you may never find out or only suspect it long after. It could be that your invention suddenly appears in a product from a competitor, or that a business deal goes awry, and you never find out why."
Dencrypt develops and markets encrypted communication solutions that enable companies and public organisations to communicate business-critical and sensitive information in a safe and secure way.

The threat is high

According to various assessments the threat of cyber espionage against authorities and companies is very high and growing. This applies to many organisations, including those operating in critical sectors such as transportation, energy, telecommunications, finance, and health care.
According to Hans Hasselby-Andersen, many companies in the private business sector are vulnerable. "Companies that are either research-intensive or have production in parts of the world where one is more exposed to surveillance should think about how they communicate digitally. With sufficient resources and technical insight, it is not particularly difficult to hack and eavesdrop on phone conversations in the mobile networks around the world. "

Dynamic Encryption

Dencrypt's communication solutions are based on a special encryption principle,

Photo: Dencrypt

Dynamic Encryption. It works by adding an encryption layer on top of an existing fixed encryption algorithm to provide extra protection. Cryptanalysis – code breaking – normally requires large amounts of data encrypted by the same method. As Dynamic Encryption is constantly mutating, cryptanalysis is rendered nigh-on impossible.

Dencrypt Communication Solution

Dencrypt enables smartphone users to communicate securely. The apps for voice communication and messaging use end-to-end encryption to protect data. This allows commonly available but unsecure data channels, such as Wi-Fi or mobile data networks, to be used for sensitive communication. Dynamic Encryption is applied to provide the highest protection level.

Dencrypt's solution is Common Criteria certified, the international standard for IT security. On this basis, the Danish Defence Intelligence Service as well as NATO have given the solution accreditation to be used for classified communication.
Dencrypt has research activities that go further into the future and are currently leading a research project on so-called quantum-safe encryption. The project is carried out in collaboration with the Technical University of Denmark and the Danish Armed Forces.
"When quantum computers become powerful enough to solve the mathematical challenges that encryption is based on today, it will affect our IT security. The research project is aimed at finding robust cryptographic algorithms that can be implemented in the communication solutions of the future."

About Dynamic Encryption

Smartphone and mobile device security is still an overlooked area for many governments, only becoming a priority after a breach.
Dynamic Encryption addresses this problem for all voice-data devices. It makes it possible to achieve extra protection by adding an encryption layer on top of an existing fixed encryption algorithm. According to Dencrypt, the developer of Dynamic Encryption, cryptanalysis (code breaking) requires accessing and reviewing large amounts of data encrypted with the same method, looking for patterns and keys to unlocking access to information. Dynamic Encryption is constantly "mutating", rendering cryptanalysis impossible.

Photo: Dencrypt

Dencrypt's Dynamic Encryption secures smartphones when using unsecure data channels such as Wi-Fi or mobile data networks. It is like trying to play a piano while middle "C" is constantly changing throughout a song, shifting the order of how notes are positioned on a keyboard - each note is never in the same position twice.
Dencrypt's Dynamic Encryption has Common Criteria certification, fulfilling the international standard for IT security. Dynamic Encryption enjoys NATO accreditation on this basis for its classified communication.
Dencrypt's current research activities include leading a new research project on Quantum-Safe Encryption in collaboration with Denmark's Technical University and Armed Forces. For more information about Dynamic Encryption, please visit **www.dencrypt.dk**

Photo: Rafael Advanced Defense Systems

The Czech Republic intends to procure four batteries of the short and medium range SPYDER air-and-missile defence system from Rafael Advanced Defense Systems and Israel Aerospace Industries. The Israeli offer competed with NASAMS (National Advanced Surface-to-Air Missile System) from a Norwegian-American consortium of Kongsberg and Raytheon.

parameters taken into consideration during the assessment included range, rate of fire and the chassis. The future Czech CAESAR SPH will be fitted on a Tatra 8x8 chassis, manufactured by the Czech company Tatra Trucks.

Combat and Multirole Helicopters

In late 2019, a Letter of Offer and Acceptance was signed for the procurement of twelve H-1 family of helicopters from the American company Bell. Under the terms of the agreement, four AH-1Z VIPER attack and eight UH-1Y VENOM multirole aircraft are to be delivered to the Czech Army.

The contract has a value of €538M with deliveries expected to commence in 2023 and run through to 2024.

The cost of the programme covers the delivery of attack/multirole helicopters, as well as the provision of weapon systems, ammunition and spare parts, a training simulator and training for pilots and ground specialist personnel.

"We accepted the US offer of a government-to-government contract for the procurement of eight UH-1Y VENOM multirole and four AH-1Z VIPER attack helicopters and today we are finally signing the contract. It is an important milestone in Czech-US relations. We will obtain modern and combat proven machines, increase our capabilities and reduce our dependence on Russian-made equipment at the same time," Minister Metnar stated.

The overall requirement of the Czech Armed Forces for new attack and multirole helicopters is said to be significantly higher. Therefore, it is expected that the Czech MoD will at least double the fleet of the H-1 family of rotorcraft in the future. They will replace currently operated obsolete Mi-8/17 and Mi-24 platforms.

"From the perspective of the Czech Air Force helicopter fleet, this is a decisive step into the 21st century. With the acquisition of the H-1 system, the Czech Armed Forces are obtaining new capabilities, including technology. We have plans envisioning deployment of the new helicopters in the future," General Opata remarked.

The H-1 family of helicopters, used by the US Marine Corps, came out best in an open tender competition. According to the Czech MoD, "the combination of VENOM and VIPER aircraft best meets the capabilities required for close air support, airlift and medical evacuation. In addition, both designs have 85% commonality," which allows for the reduction of logistics, maintenance, and training costs.

"This mix allows the Czech Republic to accomplish a diverse mission set, from humanitarian assistance and disaster relief to close air support and air-to-air warfare," noted Joel Best, Director of Military Sales and Strategy, Europe. "The advanced capabilities of the H-1 programme help ensure the safety and security of Czech sons and daughters for years to come," he added.

A number of local companies will be involved in the production, delivery and future maintenance of the family of H-1 helicopters. This includes LOM Praha and VTÚ state enterprises, Ray Service, Aero Vodochody and the VR Group companies.

During the MSPO 2020 exhibition in Kielce held this September, Joel Best confirmed that the ongoing COVID-19 pandemic and the economic crisis, which is likely to follow, is not expected to affect the H-1 programme.

"Right now there is no risk to the [delivery] schedule. We have been delivering our aircraft every single month on time to the United States Marine Corps, our supply chain is intact, our people are on the job. The process of the governmental contracting always takes time.(…) I know for a fact, that there's no risk to the number of airplanes or the schedule," Best concluded.

Photo: Nexter

In June 2020, the Head of the Czech MoD, Lubomír Metnar, announced that his department has an intention to procure 52 155-mm CAESAR self-propelled howitzers from the French company Nexter. They will replace currently operated Soviet-era 152-mm DANA howitzers.

The Czech Armed Forces will procure at least 12 H-1 family of helicopters from Bell, including four AH-1Z VIPER attack and eight UH-1Y VENOM multirole aircraft.

New Mortar Systems

The long planned acquisition of new, self-propelled 120 mm self-propelled mortar systems is another major programme included in the plans for the technical modernisation of the Czech Armed Forces. New mortar systems are expected to replace the currently operated self-propelled SPM-85 PRAM-S and towed M1982 PRAM-L artillery systems.

The Czech Army has a requirement for 62 new self-propelled mortar systems, which the country's authorities would like to manufacture locally, with the help of the local defence industry. It might seem that such a modest number of mortar systems would be enough for foreign industry partners, such as Patria, to set up their local production under the transfer of technology agreement.

The Finnish Patria is one of the companies which has expressed its intention to participate in the project. The manufacturer has already presented a turreted, remote-controlled NEMO mortar system, which it intends to offer to the Czech Army. The Finnish company, however, does not plan to offer any specific vehicle chassis, which the new mortar system could be fitted on.

Patria's Risto Paloposki, business development manager, admitted in the past that the company is aware that the Czech Army would prefer to integrate the future mortar system with a vehicle it already operates, such as the PANDUR II 8x8.

The other company which might show interest in the Czech mortar programme is the Polish Huta Stalowa Wola. The manufacturer could offer its M120 turreted mortar systems, which can be integrated with wheeled and also tracked vehicles. ■

Czech Defence Industry Continues to Invest in Electro-Optics

Founded in 2001, EVPÚ Defence is a manufacturer of electro-optical surveillance systems and electro-optical equipment for armoured vehicles, tanks, turrets and weapon stations. The company is a member of the Association of Defence and Security Industry of the Czech Republic. Patrik Hlůšek, the Commercial Director of EVPÚ Defence, spoke exclusively to ESD magazine about the company's new facilities, expanding its offering, and future programme requirements.

ESD: In light of the Future Forces Forum taking place, what is the latest news from EVPÚ Defence?

Hlůšek: While there are several things we could talk about, they all are underpinned by our having achieved a new milestone: the recent completion of another stage in the expansion of our production facilities.

This is important for EVPÚ Defence due to the ever-increasing interest in the military products we offer, meaning that we needed to build another production hall in 2019 to enable us to increase our production capacity by approximately 50%. The new production hall also houses a paint room, warehouses and clean rooms for special operations with sensitive optoelectronics in addition to mechanical assembly facilities. Our existing CNC centre was enlarged to include a new five-axis machining centre.

For many years, EVPÚ Defence has focused on the defence sector. As such, we are able to offer a wide range of special products and bespoke solutions that reflect the benchstrengths of our company. We have been able to demonstrate our deep commitment to the defence sector at national and international events in the past. Hopefully, we are able to demonstrate the strength of our products at various expositions next year, including the Czech favourite, NATO Days, which usually takes place in "normal" Septembers.

The aim of our facility's expansion was to increase our own self-sufficiency as much as it was to adapt our production capacity to heightened demand. Thanks to this inward investment of capital and resources, we believe that we will be able to reduce delivery times significantly. The results so far from this development indicate that we are evolving in the right direction and there is still interest in high quality products with a long lifespan and precise technical characteristics.

Photos: EVPU Defence

The EVPU Defence facility expansion today, with extended capabilities for R&D and production.

ESD: How do you intend to expand your defence product portfolio in 2020?

Hlůšek: While we already have a strong portfolio of defence products, we intend to add new solutions that are closely related to our current offer. However, newly developed devices or specific products and their innovations we offer will always reflect the requirements of individual customers. The saying: "Necessity is the Mother of Invention" could not be more accurate than it is at EVPÚ today. The requirement and ability to adapt a product or solution to fulfil the exact customer requirements remains one of the greatest advantages of our company. To be able to cost effectively develop a brand new, cutting edge product for a customer is a point of pride for us; and, it is in this spirit that we intend to continue making progress with EVPÚ's offering well into the future.

EVPU Defence's CRANE weapon station gunner sight with CMS-1 thermal commander sight for any RWS such as GLADIUS 12

ESD: In which of the Czech Armed Forces' modernisation programmes does EVPÚ Defence play an active role?

Hlůšek: Well, I cannot answer this question without mentioning the largest Czech tender for infantry fighting vehicles. This is where we are able to offer a wide range of proven systems that are already established in the Army. We will continue to monitor a number of other Army requirements reported in the press (like ESD!), but at the moment it remains to be seen how and if these programmes will be implemented. In any event, thanks to the increase in production capacity, we now have the most modern of facilities to fulfil their toughest requirements. We are already providing first-class military products to our nation's military. It is only a matter of learning what they need, how many and when; then we can provide our best to our nation's dedicated fighting forces – and their allies.

ESD: Thank you!

The interview was conducted by Stephen Elliot.

Medium Tactical Vehicles

Medium Tactical Vehicles (MTVs) come in a variety of shapes and configurations.

Sidney E. Dean

They can be utilised as weapon platforms or combat support vehicles, as personnel carriers (including configurations optimised for specific missions such as reconnaissance, command or liaison vehicles, or field ambulance) or as logistics vehicles. Some vehicle families include options for several of these mission categories.

Weapon Platforms/Combat Support Vehicles

The weapons platform and combat support category includes a wide range of configurations, from mobile artillery platform to anti-tank guided weapon (ATGW) carrier.

US Army Rocket Artillery Carrier

The US Army's Family of Medium Tactical Vehicles (FMTV) built by Oshkosh Defense encompasses more than a dozen different logistic and engineering support variants including flatbed trucks, dump trucks, and salvage vehicles. Both the 4x4 (6.74 metres, 10.400 kg) and the 6x6 (7.27 metres, 11.300 kg) chassis are considered medium vehicles. Payload capacities range from 2.5 tons (Light MTV) to 10 tons.

A standout among this family is the XM1140A1 carrier vehicle. The C-130 transportable, five-ton capacity XM1140A1 mounts the M142 High Mobility Artillery Rocket System (HIMARS). Assigned to field artillery brigades, the HIMARS system fires the entire spectrum of US Army multiple launch rocket artillery, including Guided MLRS rockets and the Army Tactical Missile System (ATACMS). The US Marine Corps (USMC) also operates HIMARS. FMTV units also serve as resupply vehicles for the HIMARS and MEADS launchers.

FMTV vehicles have a three-person cab, which can be optionally armoured. Various armour levels are available to match different threat environments. The all-weather capable missile carrier trucks reach speeds up to 96 kilometres per hour (kph) with a cruising range of 483 kilometres. The original FMTV entered service with the US armed forces in the late 1990s. It was based on the Steyr 12M18, but was heavily modified to design both 4x4 and 6x6 models suitable for the US Army's broad range of requirements. The current truck production model is the FMTV A1P2 configuration introduced in 2018. Production and deployment of a new configuration dubbed the FMTV A2 is scheduled to begin in 2022. The new designs include both 4x4 and 6x6 series, and have a longer wheelbase than the current vehicles.

Photo: US Army

The XM1140A1 carrier vehicle supporting the HIMARS weapon system includes an armoured cab for increased crew protection.

Photo: Oshkosh

The next generation Oshkosh Family of Medium Tactical Vehicles will have six basic variants, the smallest being the 4x4 cargo truck.

FNSS PARS 4x4

The FNSS Pars 4x4 introduced in 2015 represents a completely different MTV concept. The five-metre long vehicle is available in four configurations. These include an armoured tactical vehicle equipped with a Remote Weapon Station (RWS) with a machine gun or 40mm grenade weapon, and an anti-armour vehicle with a remotely operated ATGW mount capa-

Photo: FNSS

The PARS 4x4 in the anti-tank configuration

ble of deploying either two KORNET or two MIZRAK missiles. The vehicle and the four-person crew are protected by modular armour, transparent ballistic armour cockpit windows, explosion and leak-resistant fuel tanks, mine resistant seats, and CBRN protection.

Primarily designed to meet the Turkish army's requirements, the PARS 4x4 has outstanding all-terrain capabilities. These are enhanced by the vehicle's low centre of gravity, fully independent double-wishbone suspension, and a power-to-weight ratio of 25 hp/ton. The PARS 4x4 handles up to 70% gradients and 40% side slopes. The automatic transmission includes an axle-lock for improved traction on slippery surfaces and soft soil. Other mobility aids include a central tire inflation system (CTIS), run flat tires, a front-mounted hydraulic winch for self-recovery, and two permanently mounted propellers, which provide an amphibious capability with no preparation required. Maximum road speed is 110 kph, with a range of 700 kilometres. The turning radius is 7.5 meters. The vehicle can be internally transported by C-130 or CH-47.

Otokar AKREP II

Another Turkish-developed MTV, the Otokar AKREP II, was unveiled in 2019. The 5.5 metre, 13.500 kg armoured multi-role vehicle comes in four variants which are customised by installing different weapons turrets on the common base chassis: armoured reconnaissance vehicle, laser weapon vehicle, light infantry fire support vehicle (mounting a 25mm chain gun), and fire support vehicle (mounting a 90mm gun). The fire support variants are also suitable for quick reaction and installation security missions. All variants support a three-person crew.

Standard features of the AKREP II family include CTIS, run-flat tires, anti-locking brake system (ABS), a fully independent coil spring suspension system, a floating floor (mounted above but free of the belly armour, to minimise blast impact on the crew), a driver's vision enhancement system, and blackout lighting. Optional appointments include a commander's integrated display, drive-by-wire capability (enabling remote control operation of the vehicle), CBRN filtration, a self-recovery winch, a 360-degree situational awareness system, smoke grenade launchers, mirror cameras, an automatic fire and explosion suppression system, and rear axle steering.

Perhaps most interesting is the ability to equip the vehicle with one of three powerplants: Diesel, electric, or hybrid. The fully electric variant was designed in collaboration with AxleTech, and is designated the AKREP IIe. The electric motor is integrated with the axle and is powered by high voltage DC lithium-ion batteries. Currently, the AKREP IIe exists as a technology demonstrator. Otokar highlights the electric drive's considerably reduced acoustic and thermal signatures, enabling stealthy approach to target.

Performance parameters for all variants, regardless of the propulsion system, include a road speed of 110 kph, a 250 kilometre operational range, and excellent terrain handling (60% gradients, 40% side slopes, 45 degree angles of approach and departure).

Photo: Otokar

The AKREP II in the light infantry support vehicle configuration

Personnel Carriers and Specialised Vehicles

Other MTVs are only lightly armed or, depending on their mission designation, not armed.

Paramount MBOMBE 4x4

Paramount Group introduced its new MBOMBE 4x4 vehicle in 2019. In so doing, the South African company added an armoured MTV to its line-up of heavier wheeled vehicles (MBOMBE 6x6, MBOMBE 8x8). While the MBOMBE 4x4 can carry a top-mounted weapon station, it is designated as a troop carrier. Paramount advocates the MBOMBE family for conventional and asymmetric warfare, counterterrorism and peacekeeping operations. The MTV features a strong protection package. STANAG 4569-Level 3 ballistic and STANAG 4569-Level 4a & 4b mine blast protection are standard, as is protection against a 50 kg TNT side blast or IED. Additional applique armour packages are available on demand to provide even higher levels of protection.

The all-terrain capable vehicle achieves 140 kmh speed on-road, and has a range of 800 kilometres. The MTV is fully opera-

tional at temperatures ranging from -20 degrees to +55 degrees Celsius. The 4x4 weighs 16 tons and can carry a cumulative payload of three tons, including passengers, cargo, and mounted weapons. The MBOMBE is designed to accommodate both western and eastern made weapon systems.

The passenger cell holds six combat equipped soldiers, who enter and dismount through the rear hatch which opens as a hydraulic ramp; this enables safe egress even from a moving vehicle. Inside the cell, each soldier has his own screen-covered viewing slit and firing port on the vehicle sides, enabling them to engage attackers from cover. The two-person cab has its own doors for the vehicle crew.

The United Arab Emirates became the first state to purchase the MBOMBE 4x4 for its armed forces, announcing the contract in February 2019.

Photo: Paramount

The Paramount MBOMBE 4x4 MTV

Photo: Paramount

The MBOMBE 4x4 being tested for blast protection

KMW Dingo 3

Krauss-Maffei-Wegmann (KMW) first introduced the DINGO MTV in the year 2000; the current production model DINGO 2 entered service in 2004. The vehicle is in service with seven nations; the German armed forces remain the prime operator. The vehicle family has proven itself in operations on the Balkans, in Lebanon, in Afghanistan, and most recently in Iraq.

The DINGO is based on a militarised UNIMOG chassis, and comes in several variants which share a common set of performance parameters. These include an on-road speed of 90+ kph and an operational range in excess of 1,000 kilometres. Current production models feature STANAG 4569 Level 3 ballistic protection and Level 3a mine protection as standard, ranking it among the best-protected vehicles of its class. The DINGO can be equipped with the KMW 1530 weapon station mounting a 7.62mm machine gun or, alternately, a 12.7mm MG or a 40mm automatic grenade weapon. Other standard features include NBC protection, air-conditioning, a rear-view camera, and ABS.

Photo: KMW

The 4x4 DINGO 3 is based on the Unimog FGA 14.5 chassis.

The DINGO comes in a short or long wheelbase, for a maximum vehicle length up to 6.8 metres. Curb weight varies with variant and equipment, ranging up to 13 tons. Including driver and commander, the short-wheelbase variant carries five people, versus eight for the longer variant. The DINGO 2 is primarily configured as a protected personnel carrier, but the modular design facilitates production of mission-specific vehicles as well. Specialised iterations include battlefield maintenance vehicle, ground surveillance vehicle, NBC reconnaissance vehicle, and field ambulance. KMW is now introducing the performance enhanced third generation DINGO 3. So far, this MTV is configured in three different variants.

The 4x4 troop carrier is a direct development from the DINGO 2 troop carrier model. Enhancements include: an increased payload of up to three tons (for a maximum vehicle weight of 14.5 tons), opening up new options for mission con-

figuration; a new drivetrain with a high-torque 6-cylinder turbo diesel engine; automatic CTIS; significantly improved air-conditioning to maximise crew comfort in extreme climate zones; significantly increased electric power in preparation for future instalment of additional equipment and systems. KMW cites an operational range in excess of 800 kilometres. Driving performance and handling are improved, including addition of a driver information system and new instrument panel architecture. The modular vehicle can be outfitted with the new unified driver and passenger compartment, or with the older DINGO 2 compartment. The new compartment has a volume of 13 cubic metres and a height of 1.6 metres. It includes a rear ramp with embedded steps to ease ingress and egress.

Within the DINGO 3 sub-family, KMW also introduces a larger, 6x6 variant of the troop carrier, with a total vehicle weight up to 20 tons; this weight limit includes up to five tons of payload, and an equipment kit allowance of up to 3.5 tons. The larger cell of this variant has 17 cubic meters volume, and an improved internal height of 1.7 metres. The third axle and enlarged cell stretch the 6x6 to a length of 8.05 metres. This also translates into a passenger capacity of ten combat equipped soldiers, in addition to the two-person crew.

KMW has also presented an ambulance variant of the 6x6 DINGO 3. Given the DINGO's first-in-class armour suite, this vehicle permits battlefield recovery with a significant level of protection. The large cabin is configure as a first-aid room. It permits transport of two litter patients accompanied by two medics, and provides sufficient space for medical equipment and consumables. Access is provided alternately by a large double-door rear hatch or an electrically powered rear hatch. Litters are on- and off-loaded using an electrically powered patient loading system.

Logistics Vehicles

Other MTV families, while also have a range of variants which include weapons carriers or tactical troop carriers, are primarily utilised as logistics and engineering support vehicles.

URO TT

The URO TT tactical truck family produced by Spain's UROVESA is a prime example of an across-the-board vehicle line. Introduced in 1981, the TT line is still in production. It has been the primary source of logistics vehicles for all branches of the Spanish armed forces since 1984; numerous other nations around the world have also chosen the URO MTVs.

The modular TT family can be configured for almost any support function, from troop transport to repair vehicle, from fuel tanker to fire truck. Open flatbed, hardcover and softcover cargo beds can carry supplies and equipment within the weight constraints of the MTV design. Integrated cargo winches and cranes are available to ensure vehicles can self-loaded or unload in austere environments. All vehicles share the narrow design, which enables them to operate efficiently in tight urban spaces, forests, or on narrow wilderness roads. Rigid and independent suspension axles are available, the latter optimising the trucks' off-road capabilities. The MTVs operate at a temperature range between -20 and +50 degrees Celsius, at altitudes in excess of 5,000 metres, and in terrain, which includes snow, rock, marsh, mud or sand. Terrain handling is excellent for a high, narrow vehicle, with gradient capability exceeding 100%, depending on adherence conditions; side slope exceeds 40%, while the approach angle is 45% without deploying a winch. Fording depth exceeds 80 centimetres, while high-ground clearance stands at 40 centimetre. Gross vehicle weight varies between 12 and sixteen tons, including up to eight tons of payload. All configurations can be transported by C-130 aircraft.

Photo: KMW

The rear ramp facilitates egress and ingress to the DINGO 3 troop carrier

Mercedes Benz MTVs

Mercedes Benz's (MB) line of transport vehicles covers the gamut from vans to heavy equipment movers, with payload

Photo: KMW

The 6x6 variant of the DINGO 3 is based on the Unimog FG20A chassis. Like the 4x4 variant, it displays excellent mobility across all terrain types.

Photo: KMW

The DINGO 3 ambulance variant is devised to maximise occupant safety while facilitating loading of litter patients.

Photo: Urovesa

The URO TT displays excellent off-road capabilities including on difficult terrain.

options ranging from a half ton to 110 tons. This line-up includes three MTVs.

The AROCS for medium duty operations sports an optionally covered flatbed cargo bed capable of handling a ten ton payload. Depending on a customer's requirements, the modular vehicle can be outfitted with a choice of cabs, and comes in three lengths and four roof heights; the optional crew cab seats up to six including the driver. Cabs are zinc-coated to resist corrosion. Customers can choose between 4x2 and 4x4 drive. Off-road capabilities are good (three stars in Mercedes' scale of four), but are not up to the most challenging environments. On the other hand, MB offers an optional engine suitable for use with low-grade fuels and kerosene, a significant plus for operations in isolated or poor-infrastructure environments. Special options for extreme climate zones include air-intake pre-heaters and high performance radiators.

The two-axle ZETROS variant has a similar capability profile to the AROCS, but scores four stars for performance over difficult terrain. The ZETROS has a very robust chassis and heavy-duty frame, balanced axle-load distribution, heavy-duty planetary hub reduction axles with differential locks, CTIS, and a state-of-the-art dashboard, all of which enhance vehicle performance under off-road conditions. Seating placement behind the front axle significantly reduces physical stress and fatigue on the vehicle crew.

The most popular of Mercedes' MTVs – and one of the most successful utility vehicle concepts of all time – is the UNIMOG. This ultra-versatile truck is offered in various standardized and custom variants, including the Unimog for extreme off-road conditions. While the payload capacity is only five tons, the terrain handling capabilities are exemplary. The stated variant climbs a 100 percent gradient and has a 1.2-meter fording capability. The very short overhangs at the front and back permit high angles of approach and departure. Tire pressure can be adjusted while driving. In addition to enhancing off-road performance, the vehicle's design also minimises wear and tear while operating on difficult terrain. A high performance engine break reduces overheating and wear of the service break. Electrically assisted steering and a fully synchronised manual transmission with eight forward and six reverse gears optimise swift speed adaption to terrain; this has the added benefit of minimising the need to shift gears, thereby reducing wear on the clutch. Integrated three-point mountings protect vital vehicle components from excessive vibration and shock. Cumulatively, these enhancements permit extended maintenance intervals of 1,400 driving hours.

Appreciation

Logistics has never been considered the most glamourous of military specialties. The large number of transport trucks among the Medium Tactical Vehicles results in a relatively low profile for the MTV vehicle category. Objectively, this is unfair and unfortunate. MTVs fill a vital space between light, agile tactical vehicles and the heavy combat or combat support categories. No military unit – no matter how well armoured or how fast, can operate long without supply lines running to the front. Logistics trucks are the lifeblood of combat operations or post-combat sustained engagement.

Non-logistical MTV are vital too, providing a blend of survivability, speed and self-defence capabilities. This enables them to conduct missions for which light vehicles are too vulnerable, and for which heavy vehicles would be too slow or conspicuous. As always, the success of a military operation depends not only on having the best vehicles or the most units, but on assembling an optimal blend of forces to cover the full spectrum of mission elements. MTVs are and will remain essential to achieving this goal. ■


Photo: Suman Sharma

Israel UAE Peace Deal to Strengthen India's Ties to the Region

Suman Sharma

"Peace is not made at the council table or by treaties, but in the hearts of men."
Herbert Hoover,
former US President.

Touted as the deal of the century, the Israeli-UAE entente, announced on 13 August and officially signed on 15 September as part of the Trump Peace Plan, is truly different from Israel's earlier agreements. The Camp David Accords of 1979 between Israel and Egypt, brokered by the then US President Jimmy Carter and the Washington Declaration of 1994 between Israel and Jordan mediated by former US President Bill Clinton were more about security and strategy, as Eliav Benjamin, Director of Coordination Department at Israel's Ministry of Foreign Affairs, explains, "The earlier treaties were about security related issues and did not include trade, investments and people, but with UAE its more people driven. In its extended partnership, Israel has India in mind for joint projects for materialising the UAE peace agreement and would like to include India in tripartite talks."

UAE became the first Gulf state to ink a peace deal with Israel, paving the way for others. Bahrain too announced its willingness to follow suit, with rumours of other countries likely to pursue a similar path.

The MoD in New Delhi welcomed the move, stating, "India has consistently supported peace, stability and development in West Asia, which is its extended neighborhood. In that context, we welcome the full normalisation of ties between UAE and Israel. Both nations are key strategic partners of India. India continues its traditional support for the Palestinian cause. We hope to see an early resumption of direct negotiations to find an acceptable two-state solution."

The deal between India's two key Middle Eastern allies will benefit all three nations. New Delhi sees the move as significant given the fact that eight million Indians are employed in the region and Prime Minister Narendra Modi has earnestly courted key Arab states while maintaining arms purchases and trade ties with Tel Aviv; hence peace in the region can only benefit the Indian diaspora.

Gilad Cohen, Deputy Director General of the Asia-Pacific Division of the Israeli Foreign Ministry, said: "We are talking to the Indian Government about trilateral cooperation in areas such as agriculture, technology and water. The combination of the three countries can be for the benefit of all three sides."

How can India Strengthen Ties with West Asia by the Israel-UAE Agreement

Buoyed by the peace Agreement, many countries have welcomed the move, with Saudi Arabia and Bahrain opening their airspace for direct flights between Tel Aviv and Abu Dhabi. Kosovo and Serbia have both announced the relocation of their embassies to Jerusalem, while Turkey, Iran, Pakistan and the Palestinian Authorities have openly denounced the deal.

The new re-alignments in the region have become quite clear now, and India's relationship with the Middle East will only be bolstered by the agreement since New Delhi enjoys strategic partnerships with the UAE, Israel and Saudi Arabia. Pakistan's relations with its patron Saudi Arabia appear quite precarious after the recent refusal of the Saudi Crown Prince to meet the Pakistani Army Chief, Riyadh's demand for Pakistan to return a Saudi loan, and Saudi Arabia, together with UAE, ignoring Pakistan's requests to discuss Kashmir in the Organisation of Islamic Cooperation.

With Pakistan moving closer to Saudi Arabia's historic rivals, Turkey and Iran, geopolitics in the Middle East are being transformed. By bringing Israel into this re-alignment, the US would use the opportunity to put more pressure on Iran. The deal also buttresses India's ties to the region given New Delhi's closeness to the UAE, Saudi Arabia, US and Israel.

Navtej Sarna, former Indian Ambassador to Israel, says, "It's a good development for India given our strong ties with both Israel and UAE, and opens up possibilities of greater synergy, particularly in counter terrorism. It also halts, hopefully permanently, the ill-advised annexation plan. The challenge will be to keep Palestinian aspirations alive and push for a two state solution which can ensure long term stability and peace for Israel itself and for the region."

Still a Market for Lightweight Field Artillery?

Christopher F Foss

While many countries have replaced their towed artillery systems by 155 mm self-propelled (SP) artillery systems, tracked or wheeled, there is still a gap in the market for lightweight towed artillery systems as they can be rapidly deployed by helicopter.

This especially applies to airborne and commando type forces where size and weight of the weapon system is of considerable importance. In addition, the terrain in many parts of the world means that heavier SP artillery systems, which can weigh over 60 tonnes, cannot easily be deployed.

The main areas of improvement are the development and production of enhanced 105mm munitions including base bleed (BB), rocket assisted projectiles (RAP), and for some countries, these should be insensitive munition (IM) compliant for safety reasons. The US Army has procured large numbers of the Northrop Grumman, Armament Systems, M1156 Precision Guidance Kit (PGK) for its 155mm projectiles which provide a significant increase in accuracy. Northrop Grumman have confirmed that they had " done some internally funded development work to understand the compatibility of PGK with 105mm projectiles and have found that with slight modifications, PGK would provide a guidance fuze capability for 105mm systems."

Photo: Leonardo

The Royal Artillery BAE Systems 105mm L118 Light Gun fitted with Leonardo LINAPS carrying out a fire mission

Most investment however is clearly taking place in 155mm ammunition, which have a significant increase in range as well as having greater target effect. In addition more advanced 155 mm projectiles such as the Raytheon M982 EXCALIBUR are already deployed with longer-range ramjet projectiles now under development by a number of contractors.

In addition, an on-board navigation and computing system can be fitted such as the British Leonardo Laser Inertial Artillery Pointing Systems (LINAPS). LINAPS is a self-contained gun-mounted navigation, pointing and weapon management system providing the end user with a number of advantages.

These can be summarised as no requirement for surveying of the gun emplacement, no aiming posts needed, rapid emplacement time, improved accuracy, can be used under day and night conditions and ease of use with the minimum of user training. Ballistic calculations can be carried out on the weapon using the standard NATO ballistic kernel and it can be integrated with other sensors on the weapon including a muzzle velocity radar or laser rangefinder and interfaces with a wide range of communications equipment, which is normally provided as government furnished equipment (GFE).

Key parts of LINAPS are the inertial navigation unit (INU), layers display control unit (LDCU), distance transmitter unit (DTU) and battery power management system (BPMS), with option of a Detachment Commanders Data Terminal (DCDT), which would normally be at the battery level. The INU was the proven FIN 3110L which is an inertial navigation system/global positioning system (INS/GPS) and has proven to be very accurate with the additional advantage that if GPS is denied it continues to give a similar performance

Author

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

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Photo: Nexter

A Thai Army Nexter Systems 105mm LG1 Mk II Light Gun deployed in firing position and clearly showing turntable mounted under split trail carriage.

by integrating inertial and odometer data. The FIN 3110L has been replaced by the new 3120 which features new electronics to remove obsolescence with India and Italy being launch customers.

The latest LDCU, or Gun Laying Unit (GLU) as it is also referred to, is provided by Leonardo UK (and replaces an earlier South African system) and is the heart of LINAPS and combines a touch sensitive sun-light readable display providing the human machine interface (HMI) for the control and display facilities.

LINAPS was first installed in BAE Systems 105mm L118 Light Guns used by the Royal Artillery has also been exported in large numbers for other applications for installation on other artillery systems and has been deployed on operations in Afghanistan and Iraq. Current users include Canada (155mm M777), India (155mm M777,) Italy (155mm FH-70), Malaysia (G5 155mm), New Zealand (105mm L119 Light Gun) and Thailand (105mm L119 Light Gun).

The FIN 3110 INS is also installed on a number of other artillery systems including the 155mm AS90 of the Royal Artillery as well as Polish Krab 155mm, Oman (155mm G6) and United Arab Emirates (155mm G6 and upgraded M109, 120mm SRAMS and artillery rocket launchers)

Photo: AM General

The HAWKEYE soft-recoil howitzer from AM General, here integrated on a HMMWV, is a modern interpretation of the classic lightweight, mobile artillery system.

The French Nexter 105mm LG1 Light Gun

The French Nexter 105mm LG1 Light Gun was never adopted by the French Army Army who prefer to use the Thales (previously TDA) 120mm MO-120-RT towed rifled mortar which is operated by the artillery. The 105mm LG1 Light Gun is manufactured at the Nexter facility at Bourges and has had considerable success on the export market and has so far been adopted by Belgium, Canada, Colombia, Indonesia, Singapore and Thailand.

It should be noted that Singapore subsequently decided to standardise on 155mm artillery systems and their 105mm LG1 Mk I Light Guns were passed onto Thailand who already operated the 105mm LG1 Mk II Light Guns. Main difference between the Mk I and Mk II is that the 105mm barrels of the Mk II is autofrettaged and enables ammunition to be fired at a higher pressure, in addition the recoil system has been improved and the shield removed. It has a conventional split trail and is fitted with a 105mm/30 calibre barrel fitted with a double baffle muzzle brake and when deployed in the firing position the wheels are lifted off the ground and the forward part of the weapon rests on a turntable with the remainder of the weight taken by the two trails. Gross weight of the 105mm LG1 Light Gun is around 1,600 kg and it is claimed to be able to come into action in 30 seconds.

The 105mm Light Gun fires a new family of ammunition developed by Nexter Munitions including HE Hollow Base (HB) with a maximum range of 15,000 m and BB with a maximum range of 18,500 m and it can also fire the older 105mm M1 HE ammunition. Optional equipment being marketed by Nexter includes an on board ballistic computer and inertial positioning and laying system.

The Indian 105mm Light Field Gun

The 105mm Light Field Gun has been produced in large numbers by the Ordnance Factory Board for this Indian Army and is very similar in appearance to the British

105mm Light Gun. It has a bow type carriage and firing a 105mm HE round has a maximum range of up to 17.20 km. A SP version based on the locally manufactured BMP-2 has been developed to the prototype stage.

The Italian Leonardo 105 mm Model 56 Pack Howitzer

The Italian Oto Melara (today Leonardo) 105mm Model 56 Pack Howitzer is still deployed by many countries and its key advantage is that it can be disassembled for ease of transport over rough terrain, but production has been completed and it is no longer being marketed by the company. Maximum range of the 105mm Model 56 Pack Howitzer firing the old US M1 HE projectile is 10,575 m.

The BAE Systems 105mm L118 Light Gun

The market leader in 105mm guns is still the now BAE Systems (originally Royal Ordnance) 105mm L118 Light Gun which was originally developed by the Royal Armament Research and Development Establishment (RARDE) at Fort Halstead with production being undertaken at Royal Ordnance Factory (ROF) Nottingham which has now closed. It addition to being deployed by the Royal Artillery in batteries of six weapons, it has also been deployed by almost 20 other countries although in Australia it has already been replaced by the 155mm/39 calibre M777. The baseline 105mm L118 Light Gun fires a 105mm L31A4 HE projectile to a maximum range of 17,200 m. Other natures of 105mm ammunition include L52A2 smoke and under development is the XL32E1 HE BB which would have a range of over 20,000 m. For training a shorter barrel can be fitted with the system designated the L119 which can fire the cheaper US M1 ammunition. The largest user is the US Army with production being undertaken in the US under the designation of the M119 and with the latest version being the M119A3 which has a digital fire control system.

While production of the 105mm L118 Light Gun is now complete, BAE Systems still has quantities of these weapons for export in a fully refurbished condition and with options of a complete suite of ammunition and installation of the Leonardo LINAPS.

Serbian 105mm M56

The former Yugoslavia built large numbers of their 105mm/28 calibre M56 towed howitzer for the home and export markets and further development resulted in the M56A1 (or M56-2) which has a number of improvements including a new 105mm/33 calibre barrel made of stronger steel.

In addition to firing the older American 105mm M1 HE projectile, it can also fire a new family of ammunition with increased range and greater target effect. Yugoimport are quoting a maximum range of 15 km when firing a 105mm HE-Extended Range (HE-ER) projectile which increases to 18.10 firing a HE-ER BB projectile.

The M56A1/33 calibre has gone back in production for an undisclosed export customer who placed a contract for 36 systems.

In addition to the towed version of the M56A1, a version installed in a turret mounted on the rear of a 6x6 truck chassis with a protected forward control cab has

been developed and tested under the designation of the M109 105mm Armoured Truck Mounted Howitzer and is being marketed by Yugoimport. In this version, the 105mm weapon fires over the rear arc and four stabilisers, two either side, are deployed to the ground before opening fire.

The South African Denel 105 mm LEO

The South African company of Denel Land Systems built prototypes of their 105mm Light Experimental Ordnance (LEO) many years ago to meet the potential requirements of the South African National Defence Force (SANDF), but this has yet to enter production. LEO features a split trail and is fitted with a 105mm/52 calibre ordnance that fires a new family of ammunition developed by Rheinmetall Denel Munitions. The standard HE projectile achieved a maximum range of 24.60 km which is increased to 29.30 km using BB and 36 km using a Velocity enhanced Long-range Artillery Projectile (VLAP). The 105mm ordnance has also been used in the T7 artillery turret developed by Denel Land Systems which was, for trials purposes, installed on a US Light Armoured Vehicle (LAV) (8x8) platform, but all work on this combination has ceased.

Photo: Denel Land Systems

A first prototype of South African Denel Land Systems 105mm Light Experimental Ordnance (LEO) undergoing firing trials

Photo: Christopher F Foss

The MKEK 105mm BORAN Air-Transportable Light Towed Howitzer (ATLTH) has been developed to meet the requirements of Turkey.

The Turkish MKEK 105mm BORAN

To meet the operational requirements of Turkey, the local company of MKEK has developed the BORAN 105mm Air Transportable Light Towed Howitzer (ATLTH) with prototypes having a split trail or a bow type trails. The bow-type ATLTH will be adopted by Turkey and four prototypes were completed for trials and these will be followed by a pre-production batch.
The 105mm ATLTH weighs only 1,710 kg and has a 105mm/30 calibre barrel which enables a maximum range of 17 km to be achieved with a maximum rate of fire of 6 rounds per minute. When travelling the 105mm ordnance with a triple baffle muzzle brake is traverse through 180 degrees and locked in position over the bow trail. Traverse is 8 degrees left and right with elevation from -3 to +70 degrees but the split trail version is also being marketed with has the same elevation/depression but traverse is increased to 22.5 degrees left and right. It will be fitted with and on-board computerised fire control system, land navigation system and a muzzle velocity radar mounted above the 105 mm ordnance.

Photo: BAE Systems

The US Army M777 155mm/39 calibre lightweight howitzer carrying out a fire mission

The BAE Systems 155 mm M777

The 155mm/39 calibre M777 Ultralightweight Field Howitzer (ULH) was originally developed as a private venture by Vickers Shipbuilding and Engineering Limited (VSEL) at Barrow-in-Furness, but as a result of mergers and acquisitions it is today part of BAE Systems, Weapon Systems portfolio of weapons. By August 2020, sales had been made to Australia, Canada, India and the United States (Army and Marine Corps) with the total order book being for over 1,250 weapons. Most recent orders have been placed by India through the US Foreign Military Sales (FMS) programme for 145 of the latest M777A2 fitted with the Leonardo LINAPS. The first 25 were delivered fully assembled with the remaining 120 being assembled in India by Mahindra Defence Systems with subsystems coming from the UK and USA. All of the 155mm/39 calibre barrels are supplied by Watervliet Arsenal. In October 2018, the US Army placed a contract for a further 18 M777A2 and these will be delivered from 2021.

A key advantage of the 155mm M777 is its light weight of around 4,200 kg which enables it to be rapidly deployed by helicopters such as the CH-47 and CH-53. Maximum range depends on projectile/charge combination but it is typically 24.70 km with an unassisted projectile, 30 km with a RAP and up to 40 km with the Raytheon M982 EXCALIBUR precision guided munition. In US service the 155mm M777 has replaced the much heavier 155mm M198 towed howitzer.

The latest M777A2 has the Digital Fire Control System fitted that includes an inertial navigation unit with a GPS backup, which allows it to self-locate. In the future, a chrome-lined barrel will replace the current barrel. For trials the M777 has been fitted with a 155mm/55 calibre ordnance designated the XM351, more efficient muzzle brake, upgraded recoil system, reinforced yoke, balancer system upgrades and extended range road arms with the complete system being designated the M777ER. This is to meet the requirements of the US and Australia.

There have been a number of proposals to integrate the 155mm M777 onto a wheeled platform, including the General Dynamics Land Systems Light Armoured Vehicle (LAV) (8x8) but none of these have progressed to the trials phase.

Upgrading older 105 mm weapons

Nexter developed an upgrade for the US 105mm M101 towed howitzer which was developed before the Second World War and this kit has been sold to the Philippines and Thailand. The main part of this upgrade was the replacement of the original 105 mm barrel by a new 105mm/30 calibre barrel which is the same as that fitted to the Nexter 105mm LG1 Light Gun.

Yugoimport of Serbia has also developed upgrades for the older 105mm M101 and the former company of RDM of the Netherlands developed upgrades for the M101 which used a 105mm barrel provided by the then ROF, but all marketing of these has ceased. ■

High and Mighty

Thomas Withington

High Frequency over-the-horizon radars are a niche capability, but one which a handful of states are finding they cannot do without.

Over-The-Horizon (OTH) radars use High Frequency (HF: three megahertz/MHz to 30MHz) transmissions to detect targets beyond their Line-Of-Sight (LOS). This means these radars can avoid their transmissions being stopped by the curvature of the Earth. Radars are like human eyesight. A person with a height of two metres (6.6 feet) standing in a flat field at sea level staring at the horizon can see around five kilometres/km (three miles) in front of them. If they stand on a ladder which is one metre (three feet high), they will be able to see the horizon 6.2 km (four miles away). If they are lucky enough to be standing on the summit of Mount Everest, the horizon will be 336.1 km (208.9 miles) away. This is the case for most radars which will have their horizontal range limited by the curvature of the Earth. The exception to this rule are radars in space equipping satellites and OTH systems.

Like their HF radio counterparts OTH radars exploit the ionosphere. This is a layer of the atmosphere between 32.4 nautical miles/nm (60 km) and 540 nm (1,000 km) above the Earth which is ionised by solar radiation. This ionisation is an impenetrable wall for HF radio waves. As these radio waves cannot get through the ionosphere they are reflected to the ground. This phenomenon is known as 'skywave' propagation. It is used by HF radios to provide intercontinental ranges. OTH radars use the ionosphere as a naturally occurring satellite dish. They can bounce their transmissions off it to jump over the horizon to achieve similar intercontinental ranges. To put things into perspective: Skywave OTH radar transmissions can achieve ranges of up to 2,159 nm (4,000 km) using this technique. Professor Hugh Griffiths, the Thales/Royal Academy chair of radio frequency sensors in University College London's Department of Electronic and Electrical Engineering says that the greatest advantage of OTH radars is their ability to see well beyond LOS ranges. Why use the HF waveband? The ionosphere absorbs transmission below three megahertz. Those above 30 MHz zoom through it into space.

Photo: US Navy

The US Navy's AN/TPS-71 ROTHR radars play an important role in guarding US borders against narcotics traffickers by detecting suspicious boats and aircraft.

Pros and Cons

Despite such impressive ranges, OTH radars have drawbacks: These include the radar's difficulty in discriminating a target from clutter at long range. This is because the power of the returned echo from the target can be so weak that it can cause the target to merge into the prevailing clutter which will also be transmitting weak echoes. An example of this could be a small boat sailing on a rough sea: The size of the waves and the boat may not be that different from one another.

An OTH radar also lacks the precision of radars using microwave frequencies of 300MHz and above. OTH "resolution is poorer than microwave radars" says Prof. Griffiths: An OTH radar transmitting a beam one degree wide hitting a target at a range of 64.8 nm (120 km) will discern that target as being 1.1 nm (two kilometres) in width. The radar may have a range resolution margin of error of between 10.8 nm (20 km) to 21.6 nm (40 km). Range resolution is the radar's ability to distinguish between targets physically close together. At best, our hypothetical radar beam would only provide a bearing accuracy to within 1.1 nm to 2.2 nm (four kilometres) of the target.

To complicate matters, OTH arrays are big. An array 1,000 metres (3,280 feet) wide would be needed to generate our hypothetical signal. This makes it impractical for OTH radars to physically steer their beam by moving their antenna. Instead, these arrays use electronic beam steering to scan their transmissions across a given area by changing the phase of the

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radio waves before they are transmitted. A further consideration is saturation of the HF band. OTH radars must share the HF waveband with broadcast and communications signals, notes Prof. Griffiths "so HF radars have to fit into the available spectrum."

The efficacy of an OTH radar depends on the behaviour of the ionosphere, which can be capricious at best. A strong ionosphere will ensure that much of the radar's transmission is bounced back to Earth. A weak one will do the opposite. In HF jargon, the Maximum Usable Frequency (MUF) is the highest frequency at a given time which can be used to refract transmissions towards the Earth. The Lowest Usable Frequency (LUF) is the lowest frequency at which this can occur. Generally, the ionosphere is strongest during daytime and weakest at night. Another factor influencing the strength of the ionosphere is sunspot activity. Sunspots are dark blemishes on the sun's surface. They influence the amount of solar radiation hitting Earth's atmosphere and hence the ionosphere. Other space weather phenomena like solar flares and corona mass ejections; sudden and violent eruptions of plasma through the sun's corona which are accompanied by bucket loads of radiation also make their presence felt in the ionosphere. Computer modelling and space weather forecasting can predict the MUF and LUF for a given moment. Nonetheless, OTH radars will be able to flip rapidly from one frequency to another to outflank any disruption caused by space weather. Meanwhile, advances in signal processing could help to avoid the challenges inherent in OTH radars: "Sophisticated waveform designs dynamically adapting to the changing propagation conditions also show promise," recognises Prof. Griffiths.

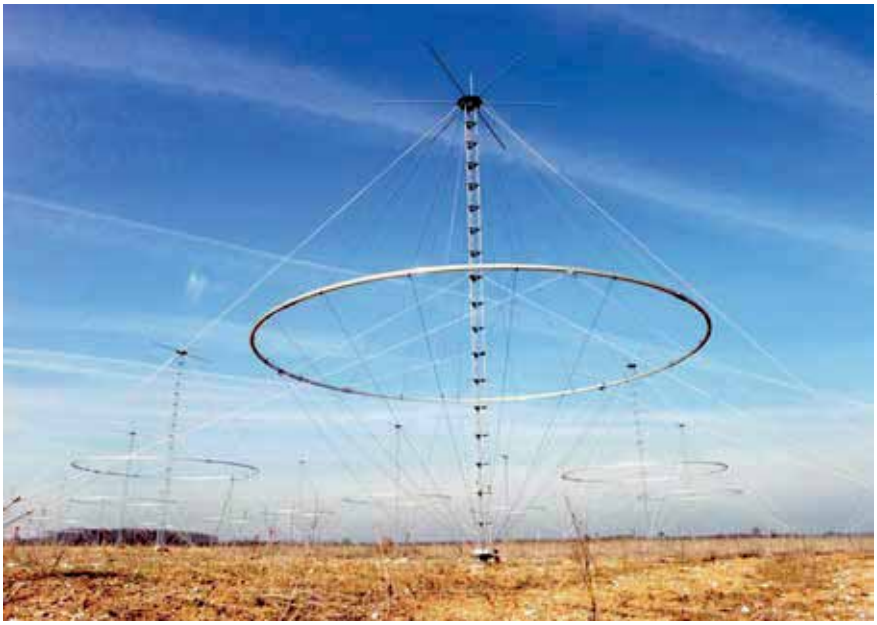


Photo: ONERA

France's Office National d'Etudes et de Recherches Aérospatiales (National Aerospace Research and Studies Office) has developed the NOSTRADAMUS radar which entered service in 2005 and is reported to have a 1,080 nm (2,000 km) instrumented range.

A handy 'added extra' for OTH radars is their ability to transmit 'surface wave' signals. Transmissions in the two megahertz to 20 MHz segment of the HF waveband exploit the phenomena of diffraction. This lets the transmissions bend around the Earth's surface. This is a particularly useful application for coastal surveillance. The surface of the sea, and the layer of moist air directly above it, provides a conductive conduit for transmissions at these frequencies. An analogy would be the way in which the flow of water sticks to the outside of a glass when as it is poured.

Surface wave transmission allow vessels to be detected several hundred nautical miles from the coast. This is particularly useful when nations want to keep tabs on their Exclusive Economic Zones (EEZs). Defined by the 1982 United Nations Convention on the Law of the Sea (UNCLOS),

Photo: Ingmar Runge

During the Cold War, Russia invested significant sums in OTH radar building the DUGA-1 (NATO reporting name Steel Work) system near the ill-fated Chernobyl nuclear plant in Ukraine.

EEZs cover maritime areas up to 200 nm (370 km) from a nation's coastline: A conventional microwave radar would need to be positioned 8,000 m (26,246.7 ft) above sea level to detect targets at the edge of an EEZ. This is achievable with maritime surveillance aircraft, but such platforms do not provide the permanent surveillance possible with an OTH radar using surface wave propagation.

Applications

The ranges provided by OTH radars means that they have been used extensively to provide early warning of incoming ballistic missiles and aircraft. Both travel long distances in short periods of time. This makes early detection imperative so that populations can be warned of incoming attacks and ballistic missile defences can be primed. Intercontinental Ballistic Missiles (ICBMs) have ranges exceeding 2,970 nm (5,500 km), and top speeds of 12,959 knots (24,000 km/h). An ICBM travelling at such a velocity could cover this distance in less than half an hour. Being able to see around the curvature of the Earth to detect ICBM launches has been bread and butter work for OTH radars since they began to be routinely used from the early 1960s. The US Magnetic Drum Radar Equipment located in Chesapeake Bay on the US Atlantic coast, was an early example of such a system.

The long-range detection attributes of OTH radars makes them a somewhat niche, yet prized, capability. The US Navy is a major user of OTH radars, notably the Raytheon AN/TPS-71 Relocatable OTH radar, better known as ROTHR. With a published range of between 500 nm (926 km) and 1,600 nm (2,962 km), the radar transmits on wavelengths of five megahertz to 28 MHz, according to open sources. Interestingly, it uses a bistatic architecture. Bistatic radars have their transmitting (Tx) and receiving (Rx) antennas located separately, whereas monostatic radars use the same antenna for Tx and Rx. The attraction of a bistatic radar is that the radar can transmit simultaneously. In a conventional radar, the system will transmit a pulse, but must then be switched off to 'hear' the much weaker echo of this signal bouncing off a target. This is because the higher level of amplification of the transmitted signal vis-à-vis the much lower amplification of the received signal would simply be impossible to hear amidst the cacophony of the transmitted signal.

By using a bistatic radar, much more frequent updates can be received regarding a target's behaviour as the radar does not have to deactivate its transmissions. However, bistatic radars must have their transmitters and receivers separated by long distances. This is because radars generate sidelobes when they transmit. Sidelobes are beams of radiation that fan out from either side of the radar's main beam as it transmits. The problem for a bistatic radar is that the sidelobes will swamp the Rx antenna if it is located too close to the Tx transmitter, again rendering the radar unable to hear the echo from the target. It is noteworthy that the AN/TPS-71's Tx and Rx antennas are separated between 50 nm (92 km) and 100 nm (185 km) from each other. The US Navy has AN/TPS-71 radars located in Texas, Puerto Rico and Virginia. Collectively, these radars cover the southern sea and air approaches to the continental United States and play an important role in combating narcotics trafficking into the country.

Russia

While the US has embraced OTH radar to help safeguard her frontiers against drug traffickers, Russia's MoD is an enthusiastic user of the technology as a means of bolstering the country's territorial air defence. A truism in radar is that the lower the frequency the easier it is to detect targets with low Radar Cross Sections (RCS). The materials and designs of low RCS aircraft, weapons and ships are optimised to outfox conventional microwave radars, more specifically for comparatively higher frequencies transmitting in X-band (8.5 GHz to 10.68 GHz) and above. The reasons for this are twofold: Firstly, the radars likely to directly threaten these weapons and platforms, the active radar homing systems used by air-to-air and air-to-surface missiles, fire control/ground controlled interception and some ground-based, naval and airborne surveillance radars, rely on transmissions with comparatively short wavelengths. Such transmissions provide the radar with a precise location of their target, something which is essential to guide a missile to its quarry.

Secondly, given that the wavelengths of such transmissions, which in X-band can be between 36 millimetres/mm to 28 mm, are so short, it is comparatively easier to build airframes, fuselages and superstructures which can use their shape to deflect transmissions away from the radar's antenna. Given that HF transmissions have wavelengths of between 100 metres (328 feet) to ten metres (30 feet) this becomes more difficult. Nonetheless, there is a trade-off. Although HF OTH radars may have the wherewithal to detect low RCS targets, they may only be able to give relatively imprecise details regarding the target's location and speed.

This has not stopped Russia from embracing this technology. The Russian Air Force is taking delivery of NPK NIIDAR's 29B6 Container HF ground-based air surveillance radar. Open sources state that this radar has an instrumented range of 1,619 nm (3000 km) and a maximum altitude

of 328,084 ft (100,000 m). The system is configured to monitor the air approaches to western Russia from NATO`s eastern flank. The radar has a bistatic design, much like the Jindalee Operational Radar Network (JORN) discussed below. As of mid-2020 it is thought that only one 29B6 has commenced operation. This radar has its Tx antenna near the town of Gorodets, east of Moscow and the Rx antenna located near the town of Kovylkino almost due south of the Tx transmitter, to the southeast of Moscow. This radar is under the command of the 590th Independent Radar Detection Centre, part of Russia's Western Military District.

Further 29B6 deliveries are planned. The Eastern Military District is expected to receive a radar scheduled for installation near the town of Zeya Amur in Russia's Far East. Similar radars will be installed in Russia's European enclave of Kaliningrad on the Baltic coast, and in Central Siberia. Plans call for an eventual procurement of twelve systems. In keeping with the prevailing intentions of the Russian government to beef up its military presence in the arctic, plans are afoot to deploy 29B6 radars there. The 29B6's concept of operations is for the radar to indicate the location of incoming low RCS aircraft and weapons such as surface-to-surface or air-to-surface missiles. This information can be used to direct Russian Air Force combat aircraft to specific sectors for the engagement of these threats, and to provide early warning of potential attack vectors for these incoming threats for engagement by ground-based air defences. While these radars will not be able to produce sufficient track quality to direct an engagement by combat aircraft or surface-to-air missile units, knowing the areas where low-RCS threats are operating will afford Russian air defenders an important tactical advantage.

Rest of the World

Australia is an enthusiastic user of OTH radars, adopting the technology back in the 1970s as the basis for its JORN radar. The JORN architecture includes two bistatic radars located in the states of Queensland, in the northeast of the country, and Western Australia. The Queensland complex includes a Tx antenna at Longreach and Rx antenna at Stonehenge, both in central Queensland. The Western Australia complex comprises a Tx transmitter in Leonora and an Rx antenna in Laverton, both towards the south of the state. Collectively these radars provide surveillance and target detection at instrumented ranges of between 540 nm (1,000 km) and 1,619 nm of the air and maritime approaches to all of northern and a good deal of western Australia, encompassing an area of 37,000 square kilometres (10,787 square nautical miles). Control of JORN is exercised from the Royal Australian Air Force's Edinburgh airbase in the state of South Australia. Open sources note that JORN transmits in a waveband of five megahertz to 30 MHz.

Photo: BAE Systems

Australia's JORN radar continues to play a key role in protecting the northern air and sea approaches to the country. The system is undergoing a major upgrade.

BAE Systems is leading an effort to digitise the JORN architecture as part of the Australian Department of Defence's JORN Phase-6 upgrade which is estimated to cost US$68M. Beyond modifying the radar's software, the initiative is rolling out new cabling and hardware at the Queensland and Western Australia sites, and at a JORN research and development radar based near Alice Springs, in the centre of the country. Official Australian government literature provides additional details regarding the scope of the JORN Phase-6 initiative. It stresses that the overall aim of the modernisation is to ensure that the Alice Springs radar can remain in service until at least 2042.

Another important part of the initiative will be constructing new ionosondes around the country. Ionosondes are radars in their own right used for monitoring conditions in the ionosphere. As stated in the above discussion the behaviour of the ionosphere must be tracked continuously to ascertain which frequencies the OTH radar can use. Although JORN already uses several ionosondes distributed around Australia, the Phase-6 initiative will establish new ionosondes in Murray Bridge, South Australia; Learmouth and Ajana in Western Australia and on Horn Island in Queensland. The reason for the upgrade of the radar near Alice Springs is to ensure that it retains a similar configuration and capabilities to the two radars in Western Australia and Queensland. While the facility in Alice Springs is primarily used for research and development, the upgrade is important as it will enable researchers to understand future modifications and augmentations that could be made to the operational JORN transmitters to squeeze yet more capability out of the system. Given that the JORN initiative can trace its genesis to the early 1970s when the Radar Division of Australia's Defence Science and Technology Organisation commissioned Project Jindalee, the radar will be almost 75 years old by the time it is expected to be decommissioned: a tangible testament to the durability of OTH radar.

Conclusions

This article has attempted an overview of the OTH radar state-of-the-art. There are scores of experimental HF OTH radar efforts ongoing around the world for which space here is insufficient to discuss in more detail. Similarly, it has not been possible to expatiate on OTH radars in the People's Republic of China, shrouded as they are in a shroud of opacity. Nonetheless, interest in this technology shows no signs of abating, and its continued refinement is awaited with anticipation in the coming years. ■

MSPO – Essential and Very Much in Demand

Michał Jarocki

All eyes were on Targi Kielce in September, where Targi Kielce president and employees' determination made it possible to overcome the coronavirus stand-still and start getting back on track.

Photo: Michał Jarocki

MSPO 2020 was the first military trade show to open after the COVID-19-driven shutdown

The expo was organised with strict observance of sanitary rules and regulations and brought together 185 companies from 15 countries. MSPO 2020 was the showcase for the elite of rocket weapons manufacturers - from US Raytheon and Lockheed Martin to the British MBDA European Missile House. The three days' exhibition attracted several thousand visitors. HE Jeremy Quin, UK Minister for Defence Procurement head of the British Lead Nation delegation said "In the UK, we are always impressed by the resilience and the determination of the Polish people… It is, therefore, no surprise, even with all the challenges that the world is currently facing, Poland has laid on a first-rate trade show today… we may be lower on numbers; we are certainly high on quality."
The stand of the Polish Armaments Group was the stage for the official agreement signing between Huta Stalowa Wola [Steelworks] SA and the Czech company Tatra Export. The contract stipulates the design and delivery of a 4x4 vehicle with complete technical documentation which makes it possible to produce the vehicle in Poland. This vehicle will be offered for the Polish Armed Forces' programs and projects the Polish Armaments Group is a part of. Ultimately, the vehicle has been acquired to expand the range of chassis for command vehicles and other specialised bodies requiring the use of

an advanced 4x4 chassis such as the Rocket and Artillery Forces.

Débuts and Premières

The equipment suppliers did not disappoint expo visitors who admired cutting-edge weaponry, helicopters and armaments. The General Jakub Jasiński Training Centre presented the Anti-Tank Mine Control System for the Engineering and Chemical Forces. "Jarzębiona" is the product's codename - the system consists of 21 anti-tank mines with an EFP charge and offers 100 meters operating range. The new Ford Ranger XLT, adapted to the military needs also has made its début at the trade show. The vehicles are produced in South Africa, and have undergone a complete modernisation, with tyres, engine and new rear-body section adapted especially for the use of uniformed services, and it has been assigned tasks from those of the Honker, heavily used by the military. MSPO was the display for the Leopard 2A4 tank, with improved ballistic protection, fire efficiency and functionality enhancement. Additional turret armour, complements weaponry modification, a new commander's sight and thermal imaging cameras, delivered by PCO, new electric drives for weapons, new fire protection and a new reversing camera, all executed by Bumar – Łabędy from Gliwice.

DEFENDER Awards

DEFENDER awards were bestowed upon:

- The Air Force Institute of Technology in Warsaw and the Central Military Bureau of Design and Technology SA from Warsaw for the e-NOSP network-centric system
- The Military Institute of Armament Technology from Zielonka, with Autocomp Management LLC from Szczecin for the shooters training autonomous simulator of the PIORUN portable anti-aircraft missile system
- ZURAD for its RobUV

The General Staff of the Polish Army, the General Command of Branches of Armed Forces and the Inspectorate for Armed Forces Support were also the medal winners in recognition of their involvement. Special thanks and appreciation was offered to Colonel Grzegorz Lisowski, Deputy Chief of Technical Services Unit of the Inspectorate for Armed Forces Support.

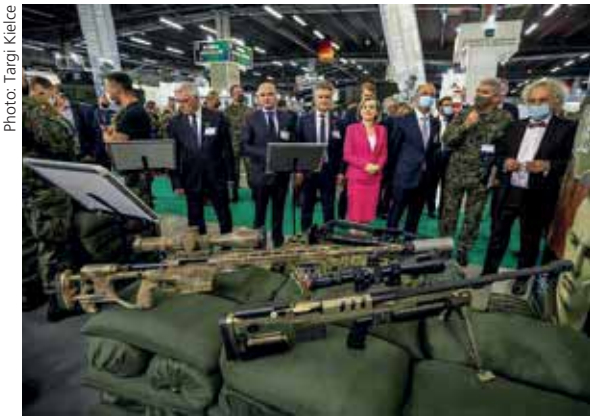
Safety Comes First

Sebastian Chwałek, Secretary of State in the Ministry of National Defence, Chairman of the Programme Board, who was personally involved in the organisation of MSPO, conveyed his thanks to all those who contributed towards making MSPOS 2020 possible, despite the current epidemic state. "We have been able to cultivate the many years' traditions and discuss safety, security, defence and weaponry."

The Świętokrzyskie region MP's, representatives of the government and city authorities were closely involved in the endeavour, which made it possible to organise this year's trade show.

"I can say that it was worth fighting for this year's only defence industry exhibition in Europe", said Andrej Mochoń, the President of Targi Kielce. ■

Photo: Targi Kielce



MSPO attracted 185 companies from 15 countries, with the UK as Lead Nation.

European PPE Procurement and Development during COVID-19

Dan Kaszeta

This magazine is normally focused on military affairs. However, to take the "security and defence" concepts seriously, European Security and Defence must address the greatest threat to individuals and economies of Europe in recent decades.

The COVID-19 pandemic is a threat across Europe. It is worth examining how well Europe, both collectively and as individual countries, is responding to this threat. An important front in the fight against this Sars-COV-2 virus has been the use of personal protective equipment (PPE) such as gloves, face masks, face shields, aprons, protective clothing, and goggles. For purposes of this article, hand sanitiser gel is included as well.

The advent of the COVID-19 pandemic widely depleted stocks of PPE across Europe in the March-April 2020 period, although the scope and magnitude of shortages varied considerably from country to country and even within countries. The spread of the illness necessitated dramatic increases in consumption of PPE across societies and across every sector of the economy.

Photo: Pixabay

The COVID-19 pandemic has widely depleted stocks of PPE across Europe.

EU Efforts

The official European Union bureaucratic reaction to the COVID-19 crisis has included numerous measures. Not every mechanism available to member states is necessarily available to the EU's central bodies. But reaction to the pandemic has been generally robust. The EU already had a Joint Procurement Agreement for medical equipment (including PPE) dating from 2013, as one of the after-action items from the 2009 H1N1 influenza epidemic. This agreement was dusted off and rejuvenated, and new signatories (such as Albania and Serbia) joined it. The first of four EU joint procurements (to date as of writing) happened quite early in the crisis – 28 February 2020. In addition, the EU Solidarity Fund was broadened in scope to allow members to access the Fund's €800M budget for health emergencies, and a percentage of this went on emergency PPE purchases. Not every country in Europe has managed to benefit from consolidated PPE procurement. Norway barely missed a deadline, enrolling several days too late to participate. The UK made a conscious decision not to take part, even though its negotiated status in the Brexit withdrawal agreement would have allowed British participate.

At the national level, as opposed to the EU level, there have been a wide variety of both successes and failures. Early in the crisis, there was some attempt to restrict export of PPE from various European countries, generally in order to ensure adequate domestic supplies. The EU quickly stepped in to stop this. Much of the national-level action has been more positive in nature. When Italy was at the forefront of the pandemic, the Czech Republic, France, and Germany provided extra PPE.

Other national-level efforts have been launched to make up for the gaps in PPE provision. Various websites and portals have been established in various countries to match PPE buyers with potential suppliers. In France, the stopcovid19.fr platform is one such example. The French also set an important precedent by sending out free masks to millions of French residents. In July 2020, it was reported that approximately 40 million washable and reusable masks were being sent out to the most vulnerable French residents.

Increasing Production

The European Commission pushed efforts to increase production of relevant PPE within the Union member states. This involved efforts to increase production from existing suppliers, reaching out to producers that did not normally sell into the EU market, and look into conversion of production lines in other industrial sectors. Standards are important in manufacturing, so the EU leaned on the standardisation bodies - the European Committee for Standardization (CEN) and the European Committee for Electrotechnical Standardization (CENEL-

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EC). At the EU's request, these bodies agreed to make several European standards personal protective equipment freely available to manufacturers, lowering the barrier to entry. Normally, manufacturers have to pay for these standards.
Although strictly not considered as part of PPE, hand-sanitiser gels quickly disappeared off shelves. Much industrial effort went into production of alcohol-based gels. In particular, large and small distilleries across Europe, some of them household names in the spirits trade, started producing hand sanitisers.

Accelerating Approvals

PPE, particularly when used in a medical setting, is heavily regulated for logical reasons. The approval processes, such as the CE conformity mark, could be a barrier to entry and prevent rapid industrial mobilisation. The EU acted relatively early on in the crisis to expedite approval processes and streamline procedures to ensure that manufacturers making new items could get into the PPE market quickly. This was embodied in European Commission Recommendation 2020/403, adopted on 13 March 2020. These temporary processes will probably have to be revised at some point, but they did help to get products onto the market. The European Commission also published a document on conformity assessment aimed at helping manufactures of other products switch to producing PPE. Similar provisions were published on hand sanitiser gels.

Free Flow of Goods Internally in Europe

The European Union is, at its heart, a trading bloc and an integrated economy. Keeping the flow of PPE moving was and continues to be essential, as few countries are fully self-sufficient in all categories. Some countries tried to enact export bans, which for trade within the EU are both against the spirit and the law. Quite early on in the crisis (10 March 2020), the European Union issued a Single Market Enforcement Action Plan to ensure that PPE could flow within the common market. In addition, on 3 April 2020, the European Commission waived custom duties and VAT on PPE imported into the EU.

Industrial Clusters

Another pan-European effort has been the attempt to leverage "industrial clusters." Not every company may have the necessary knowledge to make PPE. A research institute or university may have the knowledge, but not the facilities. The European Union has long had efforts to get different organisations working together in "clusters" and has applied this strategy to the PPE shortage. It is not hard to get cynical about such talk, but the EU's new "COVID-19 Industrial Cluster Response Portal" is actually an excellent resource. It makes a good faith effort to put as much knowledge as possible out to academia and industry. This portal, which in all fairness is broader than just PPE, is a platform for matchmaking between partners, a conduit for announcements on tenders, and a one-stop shop for information.

Photo: CDC Global

Nigerian physicians being trained by the World Health Organization (WHO) on how to put on and remove personal protective equipment (PPE) to treat Ebola patients

Technical Developments

As with other types of crisis, scientists and engineers have rushed to provide their skills and experience towards the PPE issue. A number of technical improvements and innovations have come out of the crisis. While the bulk of such developments have been in more highly visible areas like vaccine research and the ever-important ventilator manufacturing, some interesting developments have taken place in the PPE segment. Three developments of particular merit have occurred

Reuse of PPE through Decontamination

Many types of PPE, such as N95 masks, can actually be decontaminated and re-used. Medical PPE in earlier eras was routinely decontaminated and reused after use techniques like autoclaving. The need to extend the use of PPE items has led to much application of techniques such as peroxide vapour decontamination. Norway has approved such decontamination. The European Centre for Disease Prevention and Control issued a technical report in early June advising which sterilisation techniques are advisable in Europe. Companies in Europe do such contamination both as a service and as equipment providers. Bioquell (UK) is an important equipment manufacturer in this market segment. Numerous companies are operating specialty services to launder various categories of PPE, either as a new line of business or as a COVID-related expansion of existing business activity.

Photo: US Air Force

US Army soldiers pose with 3D printed masks that were donated to the Tripler Army Medical Hospital, Hawaii. The soldiers donated the face shields in response to a personal protective equipment shortage to ensure medical staff across Hawaii stay protected from the COVID-19 pandemic.

3D Printing

The relatively new field of 3D printing has been an area where some European manufacturers have sprung into action. While some types of PPE are not easily made using 3D printing techniques, face shields led themselves to manufacture by this method. The European Association for Additive Manufacturing, the pan-European 3D printing trade association, has embraced this new mission as an opportunity for its members and its industry. Numerous industrial and academic owners of appropriate 3D printing hardware have leant themselves to the task. BCN3D in Barcelona, as one example of many, has offered up its 63 printers for this task. It should be noted that 3D printing has applications far beyond PPE in COVID-19 response, such as sanitiser dispensers and ventilator components.

Improved PPE: Specialty Coatings and Materials

It has been known for a long time that various materials and substances have antimicrobial activity. Specialty coatings have long been in use in science and industry to reduce contamination. Much work has been done in recent months to incorporate substances with anti-viral properties into aspects of PPE. Face shields, gloves, aprons, filter elements in masks, and boots can all benefit from these technologies. Such technical enhancements could increase the service lifetime of PPE or increase its efficiency. Smart Separations (UK) is providing products in this field. HeIQ (Switzerland) is pioneering antiviral textiles useful for masks. Rudolf Group (Germany) has also pioneered antiviral textiles that can be incorporated into PPE. The University of Manchester (UK) has just held a web-based conference on high-tech PPE and new smart textiles in September 2020.

Problems and Issues

Not everything in the PPE market has been perfect. Any such mass purchase campaign with reduced regulatory scrutiny and high market demand will be a golden opportunity for criminals. Outright fraud and theft have been problematic, as criminals try to cash in on the pandemic. As one example of many, in April a Germany company was defrauded and an Irish national was arrested by police in Ireland in €15M PPE procurement scam. Similar stories of varying scale are numerous.

Theft of PPE, presumably for resale, has been an issue as well. An EU Horizon 2020 project called "SAFECARE" has been seeking to improve both physical and cybersecurity in the healthcare sector. Part of their work has been to track security incidents during the pandemic. This project has tracked a number of incidents, some large in scale, of thefts of PPE from medical facilities in the UK, Germany, Italy, the Netherlands, Ireland, and Spain. It is likely that many thefts go unreported as logistical systems operate under tremendous strain during this crisis.

Some problems are more in the area of quality control and consistency rather than fraud or theft. Billions are being spent on PPE imported from elsewhere, including China. The Netherlands in late March 2020 condemned hundreds of thousands of deficient masks made in China. In April, Finland condemned 2 million imported masks as substandard. Some of these incidents are due to deliberate misconduct but others are simply manufacturers not living up to the expectations placed on them. Faced with a container of defective equipment, it can be difficult to apportion blame to malfeasance or incompetence. Sweden has conducted independent testing on masks to check on compliance with standards. It should be noted that substandard PPE has come from multiple sources.

Sometime otherwise plausible PPE is accompanied by deficient paperwork. Corners on testing and certification have been cut in many circumstances. Some PPE has not been correctly tested or certified and buyers have, in effect, been defrauded because they did not receive the specification of goods that they ordered. In March 2020, a hospital in Lithuania received thousands of masks that were substandard, but still wrongly bore the European CE conformity mark. Further inquiries show that this particular incident is one of many. The European Safety Federation (ESF) maintains a running list of sources of suspicious and falsified documentation. At the time of writing, ESF was listing over 40 suspicious or fraudulent product documentation schemes applicable to PPE. Dozens of examples of dubious or unlawful certifications are listed on their website. Individual companies, nearly all of which have legitimate business in their right have had their company names appropriated for testing or certifications that are not legitimate. As one example of many, the company CE Lab (Italy) is posting notices on its own website that fake certificates bearing their name have been issued.

Repair and retrofit of substandard PPE has actually spawned a new area of enterprise. In April, an Irish company, Sullane Valley Manufacturing, announced that it was going to work to make modifications to PPE procured from China, in order to meet Irish requirements.

Conclusions

The coronavirus pandemic has highlighted that PPE is an important weapon in the fight against this disease. More rapid dispersal and use of PPE early on in the pandemic might have slowed the spread of the virus in and around early hotspots. It cannot be assumed that this pandemic is the last biological threat that Europe will face. It is likely that, going forward, efforts to stockpile PPE in case of the next pandemic will be undertaken, both collectively and at lower levels across Europe. Newer and better PPE will be the outcome of this crisis. But in practical terms all of Europe must hope that various administrative, financial, and logistical lessons have been learned. ■

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The Norwegian Navy's Future Maritime Mine Countermeasures Capability Project

Guy Toremans

The Royal Norwegian Navy and Coast Guard play an essential role in keeping the sea lines of communication open for commercial shipping, as well as for Allied reinforcements from across the Atlantic in times of crisis.

Norway is a major coastal and maritime nation. The country's maritime domain, stretching from the Kattegat/Skagerrak Straits south of Oslo, to the Eastern Atlantic, past the Greenland-Iceland-UK (GIUK) gap, through the Norwegian and Barents Seas, and up above the Arctic Circle to the High North, is of great strategic importance. Norway's defence concept emphasises the need for support and reinforcement from allies in general, and from the US specifically.

Photo: Guy Toremans

With a length of 55.2m, a width of 13.6m and a draft of only 0.84m the OKSOY/ALTA class MCMVs have a full load displacement of some 395 tons and a crew of 37 (13 officers).

A Unique Challenge

As sea mines present an increasing and unique challenge to Norway's maritime security, the Royal Norwegian Navy (RNoN) and Coast Guard play an essential role in keeping the sea lines of communication (SLOCs) open for commercial shipping, as well as for Allied reinforcements from across the Atlantic in times of crisis. The use of sea mines in conflicts effectively reduces the operational freedom of navigation and in areas with possible sea mines, the ability to find them by conducting naval mine countermeasures (NMCM) is a much needed capacity within NATO and a prerequisite for allied reinforcement. With both the northern and southern coast lines, as well as the maritime transport lines, relatively "easily" able to be blocked by sea mines, Norway is cognizant that its Navy needs to remain ready to counter the dangers posed by mines to shipping, both civilian and military, and to ensure that the vital SLOCS, strategic chokepoints, commercial ports and naval bases remain open. Consequently, the naval service is well aware that it must continue to adapt its NMCM capabilities and doctrines in order to remain one step ahead of the naval mine threat.

The RNoN's current naval mine warfare service portfolio is made up of the two OKSØY class minehunters - KNM MÄLØY (M 342) and KNM HINNØY (M 343) - and the two ALTA class minesweepers - KNM OTRA (M 351) and KNM RAUMA (M 352), supplemented by the Mine Diver Command (MDK) responsible for overseeing mine clearance in the very shallow waters and surf zones where mine countermeasure vessels (MCMVs) cannot operate. These four twin-hulled Surface-Effect-Ship (SES) MCMVs are the only remaining units from the nine-ship strong OKSØY/ALTA class inducted into the Navy in the period 1994-1997. The RNoN was the first Navy to introduce a class of naval vessels based on the unconventional SES principle into normal operational service. The 55.2-metre long MCMVs, displacing some 395 tonnes, are amongst the very best within NATO's naval inventory. The catamaran structure, jointly developed by the Royal Norwegian Navy, the Norwegian Defence Research Institute and Norsk Veritas, is claimed to give higher transit speeds with less installed power than a traditional hull design, reduced underwater magnetic and acoustic signatures, clearer water for sonar operations and less susceptibility to shock.

Although a Service Life Extension Programme (SLEP) was cancelled in 2014, the MCMVs receive incremental upgrades in order to ensure their continued operational relevance for at least another decade. As of today, both minehunters and minesweepers mount a TSM 2022 Mk2 hull-mounted sonar, a SkyDec MIL-GPS navigation system, a new Kongsberg Defence & Aerospace tactical command and control (C^2) system, a Kongsberg Defence Systems MINESNIPER

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Mk III one-shot mine-disposal weapon system (OSMDW) and a Kongsberg Simrad HUGIN 1000MR autonomous underwater vehicle (AUV) fitted with a 2G Robotics ULS-500 PRO laser scanning system and the Seashot Imager camera, an Aided Inertial Navigation System (AINS), a HISAS (High Resolution Interferometric Synthetic Aperture Sonar) and an EM2040 Multibeam Echosounder. The KNM OTRA and KNM RAUMA are equipped with traditional Oropesa mechanic sweep, a Kongsberg Defence & Aerospace Air Gun and Transducer Equipment (AGATE) system for magnetic and acoustic influence sweeping, and an ELMA magnetic sweeper. The KNM MÄLØY and KNM HINNØY each embark two Gaymarine Pluto Plus remotely operated mine disposal vehicles and a Simrad Mine countermeasure system (MICOS). In order to maintain a continuously national NMCM capability, the ALTA and OKSØY class MCMVs are scheduled to undergo another upgrade in the period 2021-2023.

The ALTA-class minesweepers' current influence sweep system will be replaced by a lightweight influence sweep based on the technology that is currently being developed for Navy's new NMCM concept. Upon decommissioning of the ALTA-class, this influence sweep system will be transferred to the new units. But with these final four OKSØY /ALTA class units approaching the end of their in-service life in the 2025-2028 timeframe, the RNoN is looking already into their replacement.

According to today's NMCM-mantra, "Keeping the men out of the minefield", moving towards autonomous mine countermeasures is also high on the RNoN's agenda. There is a consensus that instead of using expensive dedicated mine countermeasure vessels, the RNoN is also focusing on the transition from its 'traditional' platform-centric approach to one that embraces the employment of unmanned autonomous systems operating from less complex ships that stand off from the minefield in combination with manned platforms (motherships).

The naval service's major challenge is to understand what steps are necessary for the transition from its current NMCM capability to the next naval MCM-generation capabilities that are able to reduce the time it takes to find, identify and eliminate mines. The underwater conditions in Norwegian waters are quite challenging for naval mine countermeasures. The environmental characteristics of Norwegian waters do not make this challenge any easier. Extensive bottom profiling and mapping show highly variable topography with more than 50% of Norwegian areas relevant for mine clearance operations being unsuitable for mine hunting. Rough bathymetry, high clutter density, fjords with depths up to 1,000 metres, a rocky seabed, and shallow water - all 'un-minehuntable' areas - call for a robust minesweeping capability. Hence the requirement to look at the newest developments in technology and innovation in order to master all three complementary NMCM-techniques, e.g. mine hunting, mine sweeping and mine clearance diving in order to execute the complete 'detect to engage' cycle, e.g. from identification and classification to neutralisation.

Key to the RNoN's MCM is the "Future Norwegian Maritime Mine Countermeasure Capability (FNMCMC) - codenamed Project P 6359. This project, estimated to cost between NOK1.5 and 3Bn (€1.4 - €2.8Bn), also includes necessary infrastructure and support equipment to sustain the new capability. The conceptual phase, including the functional requirements, is to be concluded in due course. The RNoN will then start with the project phase. Current plans call for the FMMC to be Initial Operational Capable (IOC) by 2025 and to be Full Operational Capable (FOC) in 2028.

While specific platforms and unmanned vehicles are not yet chosen, the RNoN's FNMCMC concept is based on the use of two motherships and three NMCM-toolboxes. The motherships will provide a safe stand-off distance and embark a flexible, interoperable and modular transportable 'toolbox' that embraces a range of various cost effective, agile and sustainable NMCM-modules to be able to conduct mine hunting, mine sweeping and mine clearance diving and C4IS systems, adaptable to different operational conditions. Central to this will be a composite of unmanned surface vehicles (USV), autonomous underwater vehicles (AUV), one-shot mine disposal weapon systems (OSMDW) and, optionally, unmanned aerial vehicles (UAV), with these

Photo: Guy Toremans

KNM HINNØY, the last of the four OKSØY class minehunters, joined the fleet on 8 September 1995.

Photo: Guy Toremans

KNM MÄLØY was the third of the four OKSØY class minehunters and was commissioned on 24 March 1995.

unmanned systems to be fitted with towed (side scan sonar), mine identification and disposal system (MIDS) or influence mine sweeping (IMS) systems, suited to carry out search, localisation and classification, as well as disposal activities.

The toolbox will also provide the means to be fitted on board non-specialised vessels such as surface combatants, amphibious vessels and even from commercial support vessels, as well as from alternative platforms such as Craft of Opportunity (COOP), offshore-based installations (oil platforms) or shore-based facilities the possibility to be transported by trucks or aircraft.

Such a concept of close cooperation between the USV and AUV in conducting stand-off underwater surveys is also relevant for other applications, such as harbour security, ISR (intelligence, surveillance and reconnaissance) and REA (rapid environmental assessment).

Another added benefit is that the maintenance and system upgrades of these toolboxes are cost effective because each module can be handled individually while the remaining systems are available for operations. Furthermore, as the unmanned systems operate with a high level of autonomy, training requirements for new operators will also be less than for traditional systems.

Photo: Guy Toremans

KNM OTRA, second of the five-ship strong ALTA class minesweepers, was inducted into the fleet on 8 November 1996.

Photos: KONGSBERG

With a length of 10.5 m, a width of 3.5 m and a displacement of some 5.8 tons, Kongsberg's ODIN unmanned surface vehicle is able to embark an AUV such as the HUGIN 1000MR.

Nevertheless, the RNoN is well aware that technological innovation alone cannot produce operational mine countermeasure solutions that are effective in all conditions. Although there is a growing number of one-shot mine killer vehicles, today's, as well as tomorrow's mine threats, demand both EOD- and IEDD-capability, both involving the human operator within the MCM-chain. Hence, the 'mothership' should also be suited to embark a clearance diving team or an explosive ordnance disposal (EOD) team and also have growth potential for the future.

The Norwegian Defence Research Establishment (Forsvarets Forskning Institutt - FFI), with the Kongsberg Group are cooperating on the development of a promising autonomous MCM capacity that utilises a range of marine robotics and intelligent automation, some of which have already been developed as commercial products or have been demonstrated during sea trials.

One of these systems is the autonomous unmanned surface vehicle (USV) ODIN, capable of performing surveys and mine countermeasures missions. With a length of 10.5 metres, a width of 3.5 metres and a displacement of some 5.8 tonnes, ODIN is capable of embarking an AUV, such as the HUGIN 1000MR.

Launched from a mothership, or from a shore-based installation, the USV is used for high-speed transport and the deployment of AUVs into the assumed mine-endangered area where, in turn, the USV will launch the HUGIN 1000MR. While the AUV is performing the 'search-classify-map' phase with its advanced sensors (a synthetic aperture sonar (SAS) and

automated target recognition (ATR)) for imaging of the seafloor and water column, ODIN remains in contact with the mothership while simultaneously keeping control of the AUV. Once the charting of the seabed is finished, the AUV returns to the USV. After the crew on board the mothership has processed and analysed the gathered sonar images and live-videos provided by the AUV and identified any mine-like object, ODIN will launch a remotely controlled 'one-shot mine disposal weapon systems' to eliminate any mine in the area.

Meant to navigate autonomously close to shore, ODIN follows a route, either created manually by an operator, or by an automatic route planner service, the latter being based on S-57 Electronic Navigation Charts. Live-tests proved that this route planner is able to supply suitable routes for ODIN to carry out its missions in a safe manner.

However, ODIN is only one of several autonomous unmanned systems that Kongsberg is working on.

The company has also developed the HUGIN Superior, equipped with a HISAS 1032 dual receiver, EM2040 Mk2, camera, laser profiler and sub-bottom profiler and is testing its autonomous hybrid Underwater Intervention Vehicle (UIV) Eelume EELY500. This UIV is basically a modular self-propelled robotic arm whose flexible body can transit over long distances and is designed for inspection and intervention tasks to be carried out in confined spaces not accessible by conventional underwater vehicles or 'difficult-to-access' locations. Although primarily designed for use in the offshore oil and gas industry, the vehicle could have applications for mine countermeasures (MCM).

The RNoN is also looking into combined influence sweep (CIS) systems such as the Thales Cable Powered Advanced Acoustic Generator (CP-AAG) lightweight influence minesweeping system and the Patria Finland AK-20 lightweight acoustic sweep. The CP-AAG is designed for sweeping acoustically activated sea mines that are targeted at medium sized warships and merchant vessels and particularly suited to operate from unmanned surface vessels. Back in 2018 and 2019, the FFI already carried out some 'at sea'-tests with the Thales Cable Powered Advanced Acoustic Generator (CP-AAG) from the Navy's coastal vessels KNM MJØLNER and KNM SLEIPNER.

Although the procurement is planned as a national project, Norway is willing to enter into international or bi-lateral cooperation to further develop and implement new technology for NMCM operations.

Photos: KONGSBERG

Kongsberg's autonomous hybrid underwater intervention vehicle (UIV) Eelume EELY500 has a maximum operating depth of about 500m and a maximum speed of 4kts

Conclusion

Although the RNoN's "Future Norwegian Maritime Mine Countermeasure Capability" will bring new technologies and enhanced capabilities, the traditional NMCM is not challenged in terms of being completely replaced by remotely controlled or autonomous systems solutions, but still needs to adapt and change its traditional way of planning and conducting MCM operations. As a result, the naval staff is also looking into how autonomous unmanned vehicles will impact its Concepts of Operations (CONOPS) and procedures, their implications for operational doctrines and Rules of Engagement (RoE), as well as how the autonomous robots and humans will be able to interact more closely on the battlefield.

There are debates ahead on the merits of different operating concepts, procedures and system components in order to bring the autonomy up to the level required for the more sophisticated and hazardous applications; in particular to ensure robust and reliable operations under varied conditions and comply with the Navy's stringent security regulations.

The RNoN is exploring possibilities to load more than one AUV and multiple OSMDW on board an unmanned surface vehicle, to recharge the AUVs' batteries while these are docked to the USV and, in order to operate them at very long ranges, see to it that the USVs and AUVs have sufficient power to make sustained use of their organic sensors and communications systems. Other lines of thought are the possibilities of deploying a 'swarm' of unmanned vehicles and the introduction of Artificial Intelligence (AI); AI can suggest the best time to start an operation, the tactical employment of different unmanned systems and the degree of autonomy or manned control needed. Another important issue is how to defend these unmanned vehicles from cyber-attacks. One also has to look at their robustness, for instance to see how they can perform in a real war-like scenarios, with jamming and under- and above-water obstacles. ■

NATO's Collaborative Programmes

Alan Warnes

A new era of collaborative EU/NATO programmes is currently being ushered in, allowing the NATO nations to reduce costs and at the same time broaden their capabilities. Consolidating customer requirements and creating economies of scale for NATO, is the job of Luxembourg based-NATO Support Procurement Agency (NSPA).

It is tasked with providing cost-effective and efficient multinational solutions to 30 nations and partners. Until recently there had only been two aviation-related collaborative programmes spanning the past 40 years, the Airborne Early Warning and Control Force (AEWCF) at Geilenkirchen, Germany and the Strategic Airlift Capability (SAC) at Papa, Hungary.
NSPA's outgoing Director of Life Cycle Management, Rudi Maus who retired on 24 September, told the author: "Only one or maybe two nations can afford their own major capabilities. We have drawn new lines into the bigger acquisition programmes and professionalised it. The successes are for all to see and it is an underlying good story." Rudi, a former German Air Force general who joined NATO in 2015 continued, "Besides all the other aspects like interoperability, multinational co-operation is the way to go. The acquisition process and the developing of capabilities is very complex, the NSPA helps to smooth the way.

Photo: NSPA

A new era of NATO collaborative programmes is now being ushered in. NATO's Multinational Multirole Tanker Transport Fleet (MMF) is a great example of cooperation between OCCAR, NATO, industry, NSPA and the MMU unit. Nine A330 MRTTs will eventually be handed over to MMF with members buying time in the capability. The first aircraft is seen departing Getafe, Spain after the handover ceremony on 29 June.

MMF

The most recent big-ticket NATO programme is undoubtedly the Multinational Multirole Tanker Transport Fleet (MMF). Two Airbus A330MRTT (Multi Role Tanker Transport) of eight currently on order have so far been delivered to the Multinational MRTT Unit (MMU) at Main Operating Base in Eindhoven (The Netherlands).
First delivery took place on 29 June 2020, two months later than initially planned, due to COVID-19 and was performing training missions for the unit before undergoing a routine maintenance check (A-check). The second followed on 10 August 2020 and the third is due in October. Upon completion of the acceptance process, the aircraft are transferred (through OCCAR) from Airbus Defence and Space to the NSPA, to manage the fleet on behalf of the nations. After this, the aircraft are handed to the MMU for operational use.
The MMU provides its six partner nations (Belgium, Czech Republic, Germany, Luxembourg, Norway and the Netherlands) with strategic tanker and transport capabilities. Jan Der Kinderen, NATO NSPA's System Manager MMF, told the author, "From an operational perspective we negotiated for eight, but from a contractual perspective we negotiated for up to 11." It will allow for a ninth A330MRTT to be contracted in late September because Luxembourg now has a requirement for an additional 1,000 hours, and with the Czech contribution that's effectively an extra aircraft. "This is the beauty of a shared model. Instead of owning something, you acquire as a community of nations the capability and it's up to them how it's used," the enthusiastic Director of Life Cycle Management added.
The Netherlands and Luxembourg initially launched the programme in July 2016, with The Netherlands as the lead nation for the project. Germany and Norway joined in 2017, Belgium followed in early 2018 and Czech Republic signed up in October 2019. Five A330 MRTTs will be based at Eindhoven, Netherlands and three at Cologne, Germany, with each

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one set to fly 1100 hours a year. Germany, The Netherlands and Belgium will provide the flying staff.
Colonel Jurgen van der Biezen of the Royal Netherlands Air Force, is the commander of the MMF unit and trained along with his flying colleagues on the A330MRTT in Seville.
Germany are the largest contributors with a requirement for 5,500 hours making up five aircraft. Netherlands will take up 2,000 hours a year and nearly two aircraft, Belgium will take 1,000 hours, Luxembourg 200 (with another 1000 hours recently agreed), Norway 100 and Czech Republic 100 hours, so totting up the annual hours to 9,900. All the A330MMRTs are controlled under Dutch military rules, and will therefore wear Royal Netherlands Air Force roundels and serial.
The A330MRTTs are configured for a variety of missions, air-to-air refuelling, troop transport, VIP transport, cargo/freight transport while they can also be re-configured for aeromedical evacuation. With a 111 tonnes basic fuel capacity, the aircraft can fulfil the air-to-air refuelling mission without any additional fuel tanks and provide a maximum fuel flow rate of approximately 2,200 litres a minute. Using a boom and a hose and drogue mechanism, the tanker can quickly fuel many aircraft serving the MMF nations (Eurofighter, Tornado, Gripen, F-16, F-35 and C-17).
On 24 August, during training sortie an MMU A330MRTT refuelled a EUROFIGHTER using the hose/drogue system, while another jet like an F-16 is expected to use the boom soon.

AWACS Evolution

NATO's AEWCF was set up in 1980 with 18 Boeing E-3A AWACS (Airborne Warning and Control System) - the US term for what Europe generally calls AEW&C (Airborne Early Warning and Control). Apart from a new 'glass cockpit' there have been no new systems since 2005 and there is a desperate need for an upgrade. "It's like a game of cat and mouse," one NATO aviator told me, "Hostile countries continue to upgrade their capabilities and we can't be left behind."
NATO's 14 surviving E-3A AWACS detect actions well beyond NATO borders, and are an extremely valuable asset. They exchange information while in the air via digital data links, with ground-based, sea-based and airborne commanders, but desperately need more capacity like an enhanced satellite communications (SATCOM) system to transmit more data. Finally, after months of wrangling over the budget, a US$1Bn Final Lifetime Extension Programme (FLEP) deal was agreed upon with Boeing on 27 November 2019. NATO Secretary-General Jens Stoltenberg told reporters later: "Modernisation will ensure NATO remains at the leading edge of technology. It will provide AWACS with sophisticated new communications and networking capabilities, so these aircraft can continue their vital missions."
Despite these far-reaching upgrades, the E-3A will be retired in 2035 and plans are already in place to find a replacement. At the 2016 Summit in Warsaw, NATO launched the Alliance Future Surveillance and Control (AFSC) programme specifically to develop options for future NATO surveillance and control capabilities. In February 2017, NSPA was tasked to lead the AFSC Concept Stage and conduct studies and develop technical concepts to help shape future decisions by NATO, individual nations or multinational groups to acquire new systems before the AWACS fleet retirement.
In early December 2019, the NSPA awarded six contracts for the development of high-level technical concepts (HLTCs)

to Boeing ABILITI Consortium, General Atomics, Lockheed Martin, Airbus Germany, L3Harris Consortium UK, and MDA, under the NATO Security Investment Programme (NSIP) infrastructure programme.

The Boeing ABILITI Consortium includes Thales France, Leonardo Italy, Indra Systems, and Inmarsat. The L3Harris team includes Musketeer Solutions, Videns, 3SDL, Synergeticon, Hensoldt Sensors, IBM UK, and Deloitte Belgium.

Maus told the author: "Based on high level requirements from NATO we awarded the six HLTCs contracts to industry in the ongoing Phase 2 of the AFSC concept phase, when we contracted six industry players for their concepts. They have been submitted on time and are currently being assessed by NSPA and the nations. The results will help to further refine NATO requirements and will also be used as inputs for risk reduction and feasibility studies (RRFS) to help us move towards a technical solution. It doesn't necessarily have to be a backbone, but to link in existing and new systems as part of capability path."

These are the first steps in a series of concept development and assessment as well as feasibility study activities set to take place during the 2020-2023 timeframe. At the time, Cagatay Soyer, AFSC Project Manager said, "We are very impressed with the strong industry participation and interest shown for this visionary project. Industry's innovative thinking will help define further the NATO requirements, so they can proceed to the risk reduction and feasibility studies."

Photo: NSPA

Rudolf Maus, NSPA's Director of Life Cycle Management

Maus explained that the results from the HLTC studies and submissions from the six companies are NATO owned. NSPA will again reach-out to industry in 2021 with NATO taking the next step via the RRFS. Once the output has been assessed, there will be a 'gap analysis' ensuring there are no gaps in capability and then a move to the development/production phase in 2025. Both unmanned and manned solutions will be considered.

Rudi ended, "For us, AFSC has a high priority as it is the first NATO acquisition from scratch – to get 30 nations under one umbrella that's not easy. But we know multinational co-operation is the way forward and its setting the scene for future similar approaches. That's why I think it's a high priority."

Photo: Alan Warnes

NATO's fleet of 14 E-3As is set to be upgraded in a US$1Bn deal with Boeing. NATO is expected to replace the fleet with its Alliance Future Surveillance and Control (AFSC) solution in 2035.

Alliance Ground Surveillance (AGS)

The Alliance Ground Surveillance (AGS) system will comprise five Northrop Grumman RQ-4D GLOBAL HAWKs unmanned aerial systems (UAS). It will also include associated ground systems produced by European industries (Airbus, Kongsberg and Leonardo) to support data exploitation, analysis and distribution. Top date, four of the five aircraft have been ferried to the Main Operating Base (MOB) Sigonella, Sicily, Italy - the first on 21 November 2019 after a 22-hour flight from Palmdale, California. One of the aircraft has been made available to the NATO AGS Force to enable familiarisation and training under an early operational capability regime.

The AGS will enable NATO to perform persistent surveillance over wide areas from the GLOBAL HAWK, operating in all weather conditions at considerable standoff distances. Based in Sicily means it is not far from the Middle East and North Africa, where most of its intelligence activities will undoubtedly be focussed.

Maus told ESD, "They are under the regime of an early operational capability framework, but NATO has not taken over ownership yet, they are still in the acquisition phase under the NATO AGS Management Agency (NAGSMA)." The acquisition programme is being supported by 15 allies: Bulgaria, Czech Republic, Denmark, Estonia, Germany, Italy, Latvia, Lithuania, Luxembourg, Norway, Poland, Romania, Slovakia, Slovenia and the United States who will once the acquisition is complete will transition the system to NATO to own and operate. The transition to both the NATO AGS Force as the user and the AGS Support Partnership who is the NATO body responsible for the life cycle management of the system should occur prior to year-end.

NATO's RQ-4D is equivalent to the USAF's Block 40 derivative and will operate in all-weather conditions with the AN/ZPY-2 Multi-Platform Radar Technology Insertion Program (MP-RTIP) sensor - an advanced air-to-surface radar for wide area surveillance of fixed and moving targets. Using these advanced radar sensors, the system will continuously detect and track targets throughout the areas of interest.

MOB Sigonella will serve as a NATO Joint Intelligence, Surveillance & Reconnaissance (JISR) deployment and data exploitation centre. Just as AWACS monitors the airspace, AGS will observe what happens on the ground, providing the situational awareness required by NATO.

A New MPA Solution

NATO and the EU are keen to pursue a modern maritime patrol aircraft (MPA) requirement and NSPA will work with the interested nations and wider industry to reach that goal, just as it is with the AFSC (see earlier). Maus comments, "It is at the early stages now but more than a handful of nations are engaged with NSPA to see what's possible in the future. We are enabling it but the requirement by NATO's interested nations has to drive any solution."

A number of nations are currently pursuing a NATO initiative for an 'Accelerated Interim Multinational Maritime Patrol Aircraft Solution' (AIM2S). Simply, it is an interim MPA with very demanding requirements, which has to be available by late 2023. The NSPA has reached out to industry already and the nations are deciding if, who and what should be defined in the Memorandum of Understanding (MoU), that should be signed at the end of October 2020.

Depending upon the decision by the nations, this is an interim solution to bridge the gap up to 2035 when the Franco-German Maritime Airborne Warfare System (MAWS) cooperation project should be available. Whether the AIM2S then goes past 2035 is a decision to be made by nations depending on their requirements.

Undoubtedly, there will be several aerospace companies interested in offering a MPA capability. Alberto Gutierrez, Head of Airbus Military Aircraft told the author in November 2019: "We do believe in configuring civil platforms to the best of class military platforms, just look at the A330 MRTT. We are currently looking at A320neo in the MPA role and we are investigating critical factors like how to fly the aircraft low at low-speeds. There will be a change in avionics and the inclusion of a bomb bay for anti-submarine warfare ops – that is an area we are currently working on. The solution would see modifications to the engine and aerodynamic changes. We would need to introduce a MAWS (Missile Approach Warning System) to work in a NATO environment that will replace some other capabilities." By late September, an Airbus spokesperson told EDSR that there had not been much movement on the project since November 2019, largely because of COVID-19 restrictions.

Photo: Alan Warnes

Just over ten years ago, the Strategic Airlift Capability programme was launched with three C-17A GLOBEMASTERs. They have been serving NATO members' needs all over the globe and flew six flights delivering medical supplies during the recent COVID-19 pandemic in March-May 2020.

Photo: Northrop Grumman

The first of five RQ-4D GLOBAL HAWKs to be delivered to the Alliance Ground Surveillance Force at MOB Sigonella, Sicily, arrived on 22 November 2019. Four have so far been delivered.

PGMs

On 1 September 2020, the NSPA received the first of three shipments of Precision Guided Munitions (PGMs) for 2020, acquired through one of the NATO's so-called multinational high visibility projects. The PGMs, produced in the United States, are arriving between three to twelve months ahead of schedule and will be delivered to the nations in the upcoming weeks. NATO's multinational Air-to-Ground PGM (Precision Guided Munitions) is another similar collaborative programme. This involves thirteen allies (Belgium, Czech Republic, Denmark, Finland, Greece, Hungary, Italy, Netherlands, Norway, Poland, Portugal, Slovakia, Spain and the United Kingdom) and one NATO partner, Finland. Launched in 2014 at the Wales Summit, this multinational project offers participants a framework to acquire PGMs in a cost-effective and flexible way. According to the NSPA, working this initiative, can lead to participants lowering their acquisition costs by 15-20%. Another added benefit is that participants are able to draw upon each other's PGM stocks much more easily, for instance during air operations or in a possible crisis. This flexibility means that processing times can be reduced from months to weeks or days.

Recognising these benefits, participants have increased their orders through the NATO project. The number of different munitions and components procured through the project has also expanded, from four to 15. In 2021, the project is expected to offer further benefits by opening the doors of a first multinational munition warehouse facility to participants

Photo: Alan Warnes

European P-3 operators are thought to be calling for an accelerated interim multinational maritime patrol aircraft solution (M2S).

and other Allies and partner nations in the future.

Battling COVID-19

While NSPA normally covers major multinational weapon system acquisitions for NATO nations and partners, when COVID-19 broke out in Europe in March, we saw the gentler side of its operations. Many nations turned to the NSPA to manage the acquisition of their PPE (Personnel Protection Equipment), transport on their behalf, and at the same time gain logistical advantages and economies of scale. There were three options NSPA options in place: SALIS (Strategic Airlift International Solution), Strategic Airlift Command or NSPA chartering a commercial solution.

SALIS provided participating nations with a strategic air transport capability through Leipzig-based Antonov Logistics SALIS when required. Nine NATO Allies (Belgium, Czech Republic, France, Germany, Hungary, Norway, Poland, Slovakia and Slovenia) currently participate in the programme. Nations obtain assured access of up to five An-124 aircraft within a few days. In addition, the current contract with Antonov Logistics SALIS based at Leipzig-Halle Airport, Germany also provides access to an An-22, An-225 and IL-76 Chapter IV (more fuel-efficient and compliant with ICAO standards) aircraft.

The Czech Air Force were the first to call upon the SALIS An-124 (UR-82008) on 19 March 2020, when the huge cargo aircraft left Leipzig for Shenzhen. In China, it picked up 70 tons of medical equipment and returned to Pardubice about 78 miles (125 km) from Prague two days later. Two further flights arrived at Pardubice on 24 and 31 March. On 28 March, the Czech Republic sent 10,000 protective suits to Spain through NATO's civil emergency clearing-house, the Euro-Atlantic Disaster Response Coordination Centre.

NATO's SAC (Strategic Airlift Command) at Papa Air Base in Hungary launched mercy missions too, with the first to Seoul, South Korea coming 72 hours after the call came. The sortie to pick up 100,000 sets of PPE returned to Bucarest-Otopeni Airport in Romania on 26 March.

A third option also went through the NSPA to buy the PPE in bulk. Nations request the material through the NATO Logistics Stock Exchange (NLSE), a cooperative logistics mechanism developed to assist nations and suppliers on item acquisition and management. NSPA bought much of the material in China and then transported it to Europe using a commercial solution, Luxembourg-based Cargolux with a Boeing 747-400F and -800F. An NSPA spokesperson told EDSR: "the aircraft will fly into Luxembourg Airport and then we will transport it by road or by train to the nation."

One such flight arrived at Findel on 17 April 2020, for further distribution by road to Spain and Norway. More than a ton of medical supplies was delivered to Spain on April 20 while 600 kg of supplies went on to Norway the following week.

During the pandemic, there was 17 SALIS flights flying 950+ tonnes of medical supplies and six SAC C-17A sorties transporting 217 tonnes of medical supplies and three Cargolux charter flights as Europe battled with the invisible enemy.

NSPA might not be the solution for everything. However, it is undoubtedly a great capability toolbox, as was highlighted by the recent COVID-19 response. ■

Photo: Bundeswehr

NSPA organised 17 SALIS flights using Antonov Logistics SALIS and this An-124 based at Leipzig-Halle Airport, Germany.

Hypersonic Developments

Giulia Tilenni

The possibility to boost weapons' capabilities thanks to hypersonic technology has fuelled a new arms race ever since the Cold War. If there is still room for improvement, China, Russia and the US have already achieved interesting results in recent years, demonstrating that the R&D pace in this domain is speeding up.

Hypersonic missiles and gliders are weapons able to fly at Mach 5 (five times faster than the speed of sound), thus reaching more than 6,150 km/hour. They are also considered to be highly manoeuvrable and are more often used to refer to missiles, though the concept of hypersonic weapons is in fact broader, as it also includes gliders.

At the tactical level, research concerning Hypersonic Cruise Missiles (HCMs) is aimed at increasing the maximum speed of missiles from the current Mach 2+ to Mach 5 and more. HCMs are usually powered by scramjets (a supersonic combustion ramjet), a variant of ramjet airbreathing jet engines in which combustion takes place in supersonic airflow. Their maximum altitude reaches 20 to 30 km.

At the strategic level, R&D efforts focus on Hypersonic Glide Vehicles (HGV). Intercontinental Ballistic Missiles (ICBMs) already reach hypersonic speeds (about Mach 18 to 20) when re-entering the atmosphere. With their ballistic path well known, ICBMs are radar detectable during the first part of their trajectory. Current developments in this segment are therefore more focused on reducing predictability than on increasing speed; the goal is that gliders achieve the ability to fly at a sensibly lower altitude than ICBMs (100km and more than 1,200km, respectively) and that they are also extremely manoeuvrable. In general terms, current research is aimed at maximising gliding capabilities and aerodynamic resistance in order to make HGVs capable of vertical and horizontal, violent evasive manoeuvres at extremely high speed. Such a feature would make detection and tracking almost impossible to calculate for existing technology, thus boosting the gliders' efficiency compared to ICBMs. Even if late detection remains possible, as HGVs usually travel at faster speeds than ICBMs in the final stage of their flight, decision-makers having to assess a response option and dedicated defensive systems will most likely lack the necessary time for neutralisation.

Photo: Raytheon

An artist`s rendition of the Raytheon boost glide and air-breathing cruise missile concept

The already known downside is that a shift to gliders will reduce the number of re-entry vehicles that can be installed on a MIRV (Multiple Independently Targetable Reentry Vehicle) due to their size.

Research in the hypersonic domain is particularly expensive and time-consuming. Concerning propulsion, control and heat resistance, the development of hypersonic weapons is a real technological challenge. With this in mind, only a limited number of countries will be able to develop and afford such weapons.

China

According to experts, China has demonstrated its growing interest in hypersonic weapons since the 2010s, looking on with extreme interest at the developments in the US and Russia. Beijing has a robust R&D organisation dedicated to hypersonic weapons, something that has already allowed China to conclude a number of tests – 20 times more than the US according to 2018 figures – in order to better understand aerodynamic properties and to carry out research on thermal resistant components, among others.

In August 2018, for the first time, the Chinese government publicly addressed ongoing developments in this field following the successful test of Xingkong-2 (or Starry Sky-2), a "waverider" HCM able to surf its own shock waves. The China Academy of Aerospace Aerodynamics, the governmental agency in charge of the programme, explained that the missile was launched on a multi-stage rocket, and carried out manoeuvres at Mach 5.5 for more than 400 seconds, with a top speed of Mach 6. According to sources, it was tested with a "heat-balanced thermal protection system".

Beijing is also reported to have successfully tested two systems able to launch HGVs. The most interesting is the Dongfeng-17 (or DF-17), a medium-range ballistic missile with a 1,600-2,400 km range, designed to

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launch a specifically designed HGV. Eighteen models were paraded for the first time in 2019 during the celebrations marking the 70th anniversary of Communist Party rule in China. The first tests, successfully concluded in 2017, are considered the first HGV tests ever using a system intended to be fielded. The second system is the DF-41, a next-generation ICBM with a reported 12,000km range capable of carrying conventional or nuclear HGVs.

Russia

For Russia, developing hypersonic missiles is a means to penetrate US missile defences and restore the bilateral nuclear relationship based on vulnerability. According to Moscow, the evolution of US strategic doctrine in recent years, culminated with the end of the INF Treaty in 2019, highlights a shift from the existing MAD (Mutual Assured Destruction) doctrine to the development of first strike capabilities. No one in Russia believes that the US would effectively carry out a surprise attack to destroy the existing Russian nuclear arsenal in order to reduce the probability of success of a Russian "counter-value" strike on US infrastructures that would logically follow. However, the development of US first strike capabilities would negatively affect the credibility of the Russian arsenal, and thus serves as a push factor on hypersonic programmes.

Not surprisingly, hypersonic weapons were among the six brand new weapon systems presented by President Putin in December 2018. Launched by a MIRVed ICBM, HGV AVANGARD is reported to have an effectively unlimited range. The first test was completed in 2018 by using UR-100UTTKh, a retired model also known as the SS-19 STILETTO. The missile, launched from the Dombarovsky base, reached a target located 6,000 km away, in the Kura Missile Test Range. According to existing reports, the glider reached a speed of Mach 27 during this test, which means an estimated 1,800 to 2,000°C surface temperature. The HGV, which reportedly accommodates conventional or nuclear warheads, entered combat service in December 2019, according to Russian media outlets. In the future, AVANGARD will probably be carried by the ICBM RS-28 SARMAT, another innovation launched in 2018 and expected to be fielded in 2021.

Despite not being a proper HGV, the nuclear capable, air-launched ballistic missile (ALBM) Kh-47M2 KHINZAL is often included in Russian reports listing hypersonic weapons programmes. Its declared features are Mach 10 speed, a 2,000 km range and a weight of 4 tonnes. Derived from the 9K720 ISKANDER surface-to-surface ballistic missiles, KHINZAL was successfully tested from modified MiG-31 fighters, and the future integration on Tu-22M3 strategic bombers is under evaluation. After entering service in December 2017, the system reached its Full Operational Capability (FOC) in March 2018 and has since then redeployed in the Southern Military District. A launch over the Barents Sea from a MiG-31 based in Olenya (Olenegorsk), Kola Peninsula, suggests a redeployment to the Northern Military District as well.

Concerning HCMs, the 3M22 TSIKRON (also known as ZIRCON) is a ship-launched cruise missile that can reach between Mach 6 and Mach 8 and can strike both naval and ground targets within a 500-1,000 km range depending on the launch mode. According to TASS, this HCM can be fired by vertical launch systems mounted on several type of platforms, including on the PYOTR VELIKY and ADMIRAL NAKHIMOV battlecruisers, Project 20380 corvettes, Project 885 YASEN class submarines and Project 22350 frigates. After a development phase lasting 20 years, Russia reported a successful test from frigate ADMIRAL GORSHOV (the lead ship of the Project 22350 class) on 27 July. On the same day, President Putin announced that the Russian Navy will be armed with hypersonic nuclear strike weapons. The Russian MoD previously declared that TSIKRON was in the final phase of testing, and US intelligence sources expect the missile to become operational in 2023.

Photo: Lockheed Martin

An artist`s rendition of Lockheed Martin`s AGM-183 Air-Launched Rapid Response Weapon (ARRW)

The US

Despite the fact that research on hypersonic technology has been ongoing for several decades, proper funding was only received in the 2000s in order to promptly fill the increasing technological gap with Russia and China. Research has focused on the development of non-nuclear HGVs and HCMs only, as opposed to research carried out by competitors. This choice makes the development even more challenging, as it places additional emphasis on technical features and requires increased accuracy of the weapon systems. However, some sources speculate about nuclear efforts, as information provided by the Air Force Nuclear Weapons Centre outlines potential upgrade tracks for an ICBM with a "modular open architecture" – a feature not included in existing Minuteman II ICBMs. Tense negotiations between Washington and Moscow on the New START reduction treaty might serve as a push factor for the development of nuclear hypersonic weapons.

As the US Congress has expressed interest in the near-term deployment of hypersonic systems, the resources already allocated and those expected for R&D are consistent with this speculation. The budget request submitted to the Pentagon was only US$2.6Bn in 2020, which has since increased to $3.2Bn for the 2021 fiscal year, with additional funding expected to be allocated in the coming years. Moreover, each branch of the Armed Forces is requesting a budget for its own programmes: for the Navy, the figure is US$1Bn in 2021 and US$5.3Bn as outlined in the five-year Future Year Defence Programme (FYDP); for the Army, US$801M in 2021 and US$3.3Bn in the FYDP; for the Air Force, US$382M in 2021 and US$581M in the FYDP.

The Armed Forces and the Defense Advanced Research Projects Agency (DARPA) are currently undertaking, either alone or in collaboration with others, different hypersonic weapons and technologies programmes.

- Since 2018, the Navy is leading a programme for the development of a common gliding body to be used across the armed services. The glider is being adapted from the Army's Alternate Re-Entry System, a Mach 6 prototype warhead successfully tested in the past. Two subprogrammes are dedicated to the glider's integration. The Navy's Conventional Prompt Strike (CPS) aims to pair the glider with a submarine-launched booster system, with IOC on a VIRGINIA class submarine expected in 2028 thanks to the Virginia Payload Module. The Army's Long-Range Hypersonic Weapon (LRHW) will enable the common HGV to be incorporated into mobile, land-based deployable batteries. Flight tests will be carried out until 2023, followed by field combat rounds. The Air Force's sub-programme, the Hypersonic Conventional Strike Weapon programme (HCSWP), was cancelled in 2020 because of budgetary pressures on whether to choose between this programme and ARRW.
- The AGM-183 Air-Launched Rapid Response Weapon (ARRW), led by the Air Force with Lockheed Martin as the prime contractor, is a rapid prototyping project that intends to field an operational weapon in the 2022 timeframe. The prototype would travel up to Mach 20 speed for approximately 900 km, and it integrates DARPA's TBG technology as payload (see below). A first flight test was successfully concluded in 2019, while a final captive-carry test under a wing of a B-52 STRATOFORTRESS successfully took place on 8 August. The Air Force is acquiring four AGM-183As for live-fire tests, planned in October 2021. Should the four planned live launches be successful, the four spares already ordered could become the first operational weapons. Considered "more advanced" and with a "unique design", ARRW was finally preferred to the HCSWP as it was considered more compliant with Air Force needs. As it is smaller than the common glider vehicle, twice as many ARRWs can be carried on a B-52 and it could also possibly be carried on F-15 fighters, Air Force acquisition chief Will Roper told at the AFA's Air Warfare Symposium held in February. The fact that the F-15 could accelerate

Photo: DARPA

Bullet-shaped interceptors defend the US against attacking hypersonic weapons in an artist's concept. Such defences remain hypothetical.

Photo : US Air Force

At least theoretically the X-51A WAVERIDER will be capable of surfing on its own shock waves.

the ARRW to Mach 2 before launch, thereby potentially reducing the size of the booster needed to get ARRW to hypersonic speed, Roper added.
- Tactical Boost Glide (TBG), Operational Fires (OpFires) and Hypersonic Air-breathing Weapon Concept (HAWC), under DARPA's supervision.

The TBG and HAWC programmes are both developed in collaboration with the Air Force. The first focuses on the development of a wedge-shaped HGV capable of Mach 7+ flight, to serve as a technological demonstrator for future air-launched, tactical-range HGVs. It also studies the compatibility and integration with the Navy Vertical Launch System. The second is a longer-term programme dedicated to the development and demonstration of critical technology to enable an effective and affordable air-launched HCM.

Photo : Indian Navy

INS RAJPUT firing a BrahMos missile

OpFires seeks to capitalise on TBG technology for the development of a ground-launched system for enabling advanced tactical weapons to penetrate enemy air defences and promptly and precisely engage critical time sensitive targets. A transition to the Army in 2021 is deemed likely.

Hypersonic Defence Systems

The Pentagon's FY2021 budget request includes $206.8M for hypersonic defence programmes. Indeed, the increased pace in the development of hypersonic weapons fuels the need to find dedicated defensive solutions, mainly focused on satellites and laser weapons. Here again, a demanding and expensive task, considering the unpredictability of hypersonic weapons already explained. At the beginning of August, the US Missile Defense Agency outlined how a multi-layered hypersonic defence system should look like, illustrating its complexity. The hostile HGV should be detected by a future constellation of overhead satellites in low Earth orbit (already under development with Japan), and then tracked by a mix of air-, ground- and sea-based sensors when re-entering the atmosphere. As soon as possible, Army land-based batteries and Navy destroyers should launch a salvo of hypersonic interceptors, to be eventually followed by another salvo of terminal-phase kinetic interceptors and by blasts from high-power microwaves.

The Timely Warning and Interception with Space-based Theatre surveillance (TWISTER) was included among EU-funded Permanent Structure Cooperation (PESCO) projects in November 2019. It is led by France, with the participation of Finland, Spain, Italy and the Netherlands, and is aimed at strengthening European capabilities to detect, track and counter evolving missile threats through a combination of enhanced capabilities for space-based early warning and endo atmospheric interceptors.

Future Developments

Hypersonic weapons are probably the next revolution in military affairs, with Moscow, Beijing and Washington already part of the race. China and Russia have prioritised research in this field with the goal of countering security threats from US missiles, namely the pre-emptive decapitation of nuclear arsenals, triggered by the US withdrawal from the Anti-Ballistic Missile Treaty in 2001. For its part, Washington's step-up in hypersonic-dedicated funding and R&D in the US stems from the development of Chinese and Russian hypersonic technology.

Australia, Japan, and India as well, have all recently joined the group of countries actively carrying out research in this field. Canberra kicked off collaboration with Washington in 2007, with the Hypersonic International Flight Research Experimentation (HIFiR). Tokyo has launched research focused on the development, by 2030, of a HCM and of a Hyper Velocity Gliding Projectile; this latter development is likely to be fielded in two warheads, one for neutralising aircraft carriers and the other for area suppression. New Delhi has collaborated with Moscow on the development of the Mach 7 HCM BrahMos II, likely to be fielded by 2025-2028. India is also developing an indigenous HCM as part of the Hypersonic Technology Demonstrator Vehicle programme and has already tested a Mach 6 scramjet in 2009.

As usually happens in the defence domain, European countries are lagging behind. The fact that Russia and the US are making conspicuous investments in this technology means European countries are struggling to enter the race. However, the risk of a devaluation of the nuclear potential following a rise in the number of anti-ballistic missiles poses a real threat to France and the UK.

London is somehow in a privileged position compared to the other European countries due to its close ties with the US. The Tactical High-Speed, Responsive and Highly Efficient Round (Thresher) cooperative programme was disclosed last April. Due to be completed between 2022 and 2023, it aims at developing British hypersonic weapons capabilities.

However, the issue continues to be sensitive and crucial for France. Despite the fact that the country leads the PESCO-funded project TWISTER, efforts would still be needed to develop HCMs to prevent the existing nuclear deterrent from reaching obsolescence. Nevertheless, the need for simultaneous investment on programmes such as the next generation jet fighter and tank, the next aircraft carrier and European UAVs, indispensable to maintain Paris's military credibility at the international level, seem incompatible with the heavy investment needed to develop hypersonic weapons.

ESSOR – Tous Ensemble!

Thomas Withington

Could Europe's ESSOR tactical communications waveform programme become one of the EU's most successful collaborative defence projects?

Pan-European tactical communications undertakings do not have the same panache as the collaborative combat aircraft or armoured vehicle programmes the continent devotes its efforts to. Seeing a waveform demonstrated does not always arouse the same feelings of wonder as watching a fast jet tear up the sky at an air show, or an armoured vehicle turn a fresh field into a quagmire. However, connecting the continent's armies is just as important.

Europe's armed forces are moving closer together, driven by converging strategic and operational imperatives and the perceived weakening of the US-European alliance since the election of Donald Trump as US President in November 2016. The European Union (EU) is engaged in several operations under the auspices of its Common Security and Defence Policy (CSDP). The CSDP is the main arm of the EU's Common Foreign and Security Policy. This facilitates civil and military deployments to support peacekeeping, conflict prevention and enshrine the EU's collective self-defence. As of May 2020, the EU is engaged in several ongoing military missions around the world. These deployments are confined to training and mentoring in the military and policing spheres, and security sector reform, alongside monitoring missions. Nonetheless, as the United Nations'(UN) Mission de l'Organisation des Nations Unies pour la Stabilisation en République Démocratique du Congo (MONUSCO/UN Organisation Stabilisation Mission in the Democratic Republic of Congo) has illustrated, there is every chance that supranational organisations like the EU can find themselves embroiled in comparatively high tempo operations, despite being initially deployed in a peacekeeping context should things get sticky and the mission gets the green light from its political masters to give the bad guys a kicking.

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Photo: EU

The burden of military commitments is only likely to increase for the EU in the future. The advent of the ESSOR HDR waveform will be a major step forward in assisting the carriage of data-heavy traffic between coalition partners.

In March 2013, MONUSCO was cleared by the UN Security Council to perform operations against armed groups threatening the peace in the eastern DRC.

It is a little known fact that the EU is also committed to the mutual defence of its members, much like Article Five of the North Atlantic Treaty which pledges NATO (North Atlantic Treaty Organisation) members to treat an attack on one member as an attack on all. Article 42.7 of the Treaty on European Union, also known as the Maastricht Treaty, pledges the EU's membership to a similar collective defence stating that "if a member state is the victim of armed aggression on its territory, the other member states shall have towards it an obligation of aid and assistance by all the means in their power." The article was invoked by the French government in the wake of the attacks by the ISIS (Islamic State of Iraq and Syria) insurgent organisation on several targets in Paris on 13 November 2015, with requests to EU members to help support French counter-ISIS operations in Iraq and Syria, and to help support ongoing operations in other parts of the world freeing up French troops to fight ISIS in these two theatres.

PESCO

It is not difficult to envisage how a similar situation might arise in the future, only this time perhaps involving the deployment of manoeuvre forces from EU members perhaps to deter a Russian advance into the Baltic states or Scandinavia in a situation where Washington, D.C. was either unwilling or unable to assist. Having the wherewithal to ensure that disparate land forces can communicate with each other to share situational awareness and command and control data safely and efficiently would be a sine qua non for any deployment.

Such considerations have been instrumental in encouraging several EU nations to develop the ESSOR (European Secure Software Defined Radio) waveform. Armies use a diverse array of radios across the EU from the Thales PR4G Fastnet family used by the Armée de Terre (French Army) to the L3Harris RF-7800S Ultra High Frequency (UHF: 350 megahertz/MHz to 450MHz) systems used for inter/intra-squad communications by the Svenska Armén (Swedish Army) and Leonardo's SWave radios used by the Italian armed forces. The European Secure Soft-

Photo: Rohde und Schwarz

Rohde and Schwarz will be responsible for porting the ESSOR waveform into the new SOVERON family of tactical radios (shon here) which will be used by the German armed forces. The waveform is expected to enter German service in 2023.

ware-Defined Radio (ESSOR) High Data Rate (HDR) waveform will allow them to communicate seamlessly with one another and thus improve the efficacy of multinational operations.

The ESSOR programme is one of the European Union's flagship Permanent Structured Cooperation (PESCO) projects. Interestingly, Article 42.7's neighbour Article 42.6 along with Article 46 and Protocol 10 of the Treaty on European Union provide the framework for PESCO which is focused on strengthening defence cooperation at the industrial, and research and development levels. Speaking in December 2017 Federica Mogherini, the EU's high representative for Foreign Affairs and Security Policy, neatly summed up the strategic and industrial symbiosis at the heart of the PESCO approach foreseeing that member states will "join forces on a regular basis, to do things together, spend together, invest together, buy together and act together." Today, there are 47 PESCO projects ranging from future medium-altitude, long-endurance uninhabited aerial vehicles to the establishment of a European joint intelligence school with ESSOR forming one of the 17 original PESCO programmes adopted by the European Council, which comprises the heads of government of the EU's membership along with the European Council President and European Commission President. The commission is responsible for deciding the general political trajectory and priorities of the EU.

Despite ESSOR now being under the PESCO flag, the initiative kicked off in December 2008 under the auspices of the Organisation Conjointe de Coopération en Matière d'Armement (OCCAR/Organisation for Joint Armament Cooperation); the supranational body which manages collaborative European defence programmes, and which retains responsibility for the initiative. Six nations comprise the initiative; Finland, France, Germany, Italy, Poland and Spain with the work being undertaken by a consortium known as A4ESSOR. This includes Bittium, Indra, Leonardo, Radmor, Rohde and Schwarz, and Thales. With the contract signed by A4ESSOR and OCCAR in late 2008 initial work focused on the definition of the HDR waveform's specifications with developmental work commencing in 2011. The specifications called for a UHF waveform carried across frequencies of 225MHz to 400MHz accommodating up to 200 nodes per network across network ranges of up to 130 kilometres (70.3 miles). The waveform would need to sustain unicast, multicast and broadcast communications, support full duplex data and VOIP (Voice over IP) communications, and carry data-heavy applications like live video at data rates of up to one megabit per second.

ESSOR Transmission Security (TRANSEC) requirements called for fast frequency-hopping and the wherewithal to work in an environment where GNSS (Global Navigation Satellite Services) maybe badly degraded or unavailable. This last point is noteworthy: Radios depend upon precise timing much like other electronic devices. This can be delivered through GNSS constellations like the US Global Positioning System or Europe's Galileo which must transmit a time signal to ensure that navigation devices can accurately deliver navigational information. GNSS jamming is in the spotlight following persistent reports that the Russian armed forces deployed Protek R-330 ZHITEL land-based electronic attack systems to support that country's deployments to Ukraine and Syria respectively. The R-330 is strongly suspected of being responsible for jamming satellite navigation signals, and hence GNSS time signals, across wavebands of 1.1 gigahertz/GHz to 1.6GHz. While militaries can use encrypted GNSS signals in a bid to outflank potential jamming, it is important that ESSOR operates in environments where aggressive GNSS jamming, which may even affect encrypted transmissions, might occur. Another important requirement for ESSOR is that it can be ported into existing and legacy radios used by the armed forces of the ESSOR partner nations and potentially those of other nations joining the initiative at a later date. Sources close to the programme have revealed that the waveform's export potential maybe greatly eased as it is free from any ingredients potentially covered by the US ITAR (International Traffic in Armaments Regulations) strictures.

Development

Demonstrations of the waveform commenced in late 2015 including to delegates attending the 2016 Eurosatory defence exhibition held in Paris. Later field demonstrations showed the waveform's ability to connect up to 15 nodes. In one notable laboratory test performed in Gdynia, northern Poland, in June 2015 the waveform demonstrated that it could connect military radios from Finland, France, Italy, Poland and Spain carrying VOIP, conference call, video call, file transfer, IP data and video streaming using TRANSEC between these sets. Likewise, field tests performed in Paris in October 2016 showed that the waveform could support mobile ad hoc networks with ranges of up to 80km (43.2 miles) using four radios carrying data, video and VOIP traffic. Field tests one month later in Finland included 15 nodes moving in an area of 120 square kilometres (46.3 square miles), mimicking the deployment of a three-company battlegroup.

Where do things stand with ESSOR now, and what is the way ahead? While the first phase of the programme, which concentrated on the ESSOR architecture and the waveform's development concluded in 2015. The second phase, which focuses on transitioning ESSOR from a prototype into a final product, a process dubbed Operational Capability-1 (OC1) was scheduled for completion in 2021, notes Lino Laganà, president of A4ESSOR. Although the ongoing COVID-19 pandemic could see this date moved into the future given the restrictions that quarantines and lock-downs are having for companies around the world. At present "we are adding new features to the waveform based on feedback from the

field tests," Mr. Laganà notes, "to work towards a final product." OC1 endeavours also include devising a through life management process to maintain and enhance the waveform over the next two decades, says a written statement supplied to the author by Bittium.

New participants have joined the initiative with Germany becoming an ESSOR partner nation this March, and Rohde and Schwarz becoming an industrial member of A4ESSOR: "Rohde and Schwarz is not contributing to the development, but will adapt the ESSOR waveform for local German requirements and port this into German armed forces' radios," Mr. Laganà continues. Principally, these will be the Soveron-D multiband sets which use frequencies of 30MHz to 512MHz entering service with the Heer (German Army) manoeuvre force command and control vehicles, and field headquarters. Rohde and Schwarz said in a written statement that Soveron-D and ESSOR will be key enablers "for the digitisation of the German armed forces in networked, real-time and for secure transmission of voice and data traffic." Giving an indication as to how the waveform may be used by the German armed forces and by those of Germany's ESSOR partners, the waveform is expected to be used for the carriage of command and control, and situational awareness traffic at brigade and below levels, the statement continued. This could be between echelons in a deployed army, or across echelons in a multinational context.

From an organisational perspective Mr. Laganà says that while all A4ESSOR members contribute to all aspects of the waveform's evolution specific tasks are divided amongst the membership. For example, Leonardo has led the waveform's development phase and Radmor has led the testing work. This is in addition to the work these firms perform helping to port the waveform into the radios used by their armed forces: Bittium is porting the waveform into its Tough SDR series of radios which it is in the process of delivering to the Finnish armed forces as they perform a parallel modernisation of their radio hardware: "This porting is now proceeding from a design phase into an implementation phase," says Bittium's written statement.

Although the COVID-19 situation could retard the progress of the programme Mr. Laganà remains bullish that schedules can be met. He expects the waveform to be ready for use by the initial ESSOR partners in 2022, and Gemany following in 2023. The reason for this one year delay being Germany's relatively late entry into the programme. Germany might not be the only new nation which joins the initiative: "There is growing interest in the programme," says Mr. Laganà: "My expectation is that others will join, or will ask to use the architecture." The waveform might even see North Atlantic Treaty Organisation (NATO) interest. The alliance has an outstanding requirement for an alliance-wide HDR waveform. This was to have been satisfied through NATO's COALWNW (Coalition Wideband Networking Waveform). COALWNW involved Australia, Finland, France, Germany, Italy, Spain, Sweden, the United Kingdom and the United States. It planned to develop a UHF wideband waveform, however sources in the European tactical communications community inform the author that COALWNW is, for all intents and purposes, dead. Nonetheless just because the initiative has gone away, does not mean that the requirement has disappeared. ESSOR, or a variant of the waveform therein, could be in a good position in the future to meet these requirements.

Conclusions

While there is still work to be done ESSOR could emerge as the right waveform at the right moment. Two major drivers; the need for data and hence bandwidth within and between armies, and the need for Europe's armed forces to operate multilaterally could be met by ESSOR. The EU is emerging as a military power in its own right, albeit with the small but significant steps as exemplified by the missions noted above. Should isolationist tendencies continue to influence aspects of US foreign policy the European Union may see itself increasingly called upon to intervene where Uncle Sam is unable or unwilling to tread.

Concurrently, collaborative programmes offer the EU taxpayer value for money. To put matters into perspective, figures released by the European Commission, the EU's executive branch, noted that EU members spent $249 billion on defence in 2017 versus the almost $600 billion of the United States equating to 1.34 percent and 3.3 percent of gross domestic product respectively. At the same time, the US has one type of main battle tank versus the 17 different types used by EU members; she has four different types of frigates and destroyers compared to the 29 different types used by EU members; with six different types of combat aircraft being flown as opposed to the 20 different types flown in the EU. It would be folly to believe that the European Union's membership will eventually reach US levels of defence spending, particularly as electorates are arguably more likely to prioritise health, education and social spending over defence expenditure, particularly against the backdrop of a global pandemic with a presently indeterminable duration. Nonetheless, shortfalls can sometimes be met by spending smarter. There is little sense for each EU member to develop their own HDR waveform hoping that these will somehow mesh together and help facilitate coalition operations. Such a course of action leads to a lack of coordination, duplication of effort and potential disappointment metamorphosing into rising figures on a balance sheet. Instead, the pooling of resources and know-how to develop a capability which armies are desperate for is an arguably cost-effective approach satisfying military need and the taxpayer at a stroke. ■

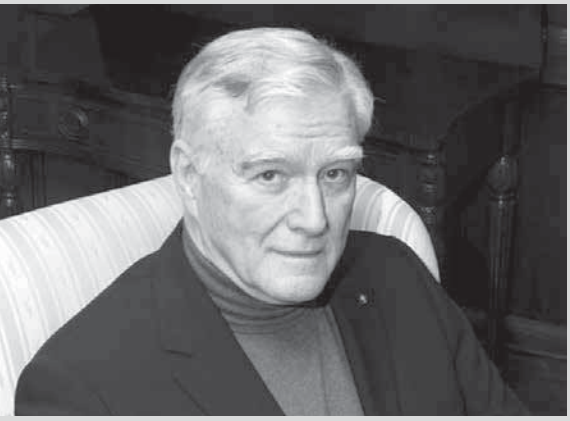
Photo: Bittium

Bittium is leading the effort to port the ESSOR waveform into the Finnish armed forces' new Tough SDR tactical radios; two examples of which are shown here. Concerns over confidentiality have meant that the ESSOR partners' tactical radio companies are responsible for installing the waveform domestically.

Photo: Thales

The French CONTACT tactical radio modernisation programme will include the adoption of ESSOR in a new family of radios which will equip the country's armed force. The SYNAPS-V, the export version of the CONTACT vehicular radio, is shown here.

Viewpoint from Washington



What is at stake?

Chet Nagle

As these words are being written, America is less than 60 days from the most important election in United States history since 1860. That election pitted Republican Lincoln against Democratic Party Douglas, Southern Democratic Party Breckinridge and the Constitutional Union Party's Bell. Lincoln won by a landslide in the Electoral College, but received only 40% of the popular vote. As a result, eleven states seceded from the Union and the appalling Civil War began. It is not possible to overstate the danger that America may fall into a similar abyss.

The candidates in November's election have such diametrically opposed policies on America's economy, domestic politics, defense, and foreign policy that either winner will have a massive impact on the United States and therefore on every other nation on the planet. Simply put, if President Trump wins he will not be constrained by concerns about reelection and so will accelerate his existing programs and policies. If Biden wins, he will impose radical changes in policies and laws that govern America's domestic tranquility and international influence. Since Trump's policies are well known, we turn to what Joe Biden and Kamala Harris have promised in speeches and in the Democrat party platform. Among other things, they have promised to:

- Vastly increase individual and corporate taxes.
- End construction of the border wall and remove existing walls.
- Increase the number of refugees and illegal aliens.
- Provide free health care, education and subsistence to all illegal aliens.
- Adopt the "Green New Deal" net-zero emissions economy by 2050.
- Enforce a mandatory firearms buyback program.
- Provide "Medicare for all."

Author

Chet Nagle is a former Pentagon official, the author of Iran Covenant, and the CEO of Ravenna Associates, a strategic communications company.

Biden's promises and Trump's existing polices are pieces in a fiery mosaic that is pre-election America today. We must examine the larger pieces in that picture in order to estimate the outcome of the election and what may happen in its aftermath. For instance, Biden's running mate.

Kamala Harris is important because most Americans believe that if Biden is elected he will step down and she will become president during the next four years. Some view the choice of Kamala, daughter of a Jamaican father and an Indian mother, was a slight to Hispanics and African-American voters. Be that as it may, her selection over other candidates like Susan Rice, Obama's National Security Advisor, is a mystery to many in both political camps because of her history of adopting positions only to change them when hit with blowback or an opportunity for advancement. Such blatant opportunism is attractive to major financial backers, like tech and media oligarchs, who value her malleability should she become president.

Mainstream media and polls have been intertwined for five years in their determination to report unfavorably on Trump, even before he was elected. The Media Research Center analyzed statements of reporters and anchors on CBS Evening News, NBC Nightly News and ABC World News Tonight. It showed they were 150 times more negative in covering Trump than Biden. This is not lost on most Americans, and online news and websites have become their main sources of news and commentary. Because of the 2016 election so few believe polls that American oligarchs create organizations to get at the truth. Hawkfish, an analytics firm created by billionaire Bloomberg, has predicted Trump will have a landslide on election night but Biden will then win the election weeks later after mail-in votes are counted.

Trump´s base is growing because the foremost concern of Americans has shifted from the pandemic to the economy and law and order. Costly and deadly rioting in many Democrat-managed cities has frightened the electorate, and even the mayors of those cities are fearful. Six Democrat mayors of cities in Minnesota have taken their concern even further by endorsing Trump for president! Anxiety of city dwellers is causing an exodus from New York and other

cities, while rural and suburban dwellers hit a record pace in August for buying firearms. Trump's stand on law and order has resonated with them all, so the Democrat leadership has finally dropped their "peaceful protest" label for BLM/Antifa violence in favor of "riots and looting" and blaming everything on Trump.

Biden's base has never been famous for large rallies and Trump rallies have been hampered by the pandemic. So Trump supporters took to the water, holding giant rallies of rowboats and yachts on rivers and lakes that the media pretends don't exist. The boaters' enthusiasm is mirrored by advances in the number of Trump supporters in the black and Hispanic communities. Even Jews are shifting their traditional Democrat allegiance because of Trump's brokering the recognition of Israel by the UAE that has earned him a nomination for the Nobel Peace Prize. Rasmussen, an apolitical pollster, noted on 4 September that Trump's approval rating among likely voters is now 52%. That supports the conclusion reached by Las Vegas bookies. In September they too began predicting a Trump victory after seeing the number of blacks planning to vote for Trump rise to the stunning level of 28% and that of Hispanics to 41%. Despite these changing numbers and estimates, it is the election process itself that emerges as the key piece in the election mosaic.

Vote-by-mail and ballot fraud could skew the election and lead to post election violence. Absentee ballots, filed by a voter with a valid reason to be away from his home polling place, has safeguards like voter ID. Mail-in ballots are simply posted to the last known address of a voter and are very vulnerable to fraud. Recent proof of that practice appeared when a Democrat operative exposed how he conducted large-scale mail-in voting fraud for years in New York, New Jersey, and Pennsylvania, rigging elections for Democrats by printing fake ballots, conning the elderly, posing as registered voters, and paying homeless voters. There are dozens of reported instances of such mail-in voting fraud in the recent primary elections. It is worrisome that some 27 states now permit some form of mail-in voting.

Besides risk of fraud, mail-in ballots mean that election results will not be known on Election Day. Final results will depend on counting mailed ballots, and that may take days or weeks. Nevertheless, vote counting must end on 14 December, the day that federal law requires each state send its electors to the Electoral College to "meet and give their votes." That means whomever is ahead in each state on 14 December will garner that state's electors, and the candidate with the majority of those electors wins. But there are ominous signs that things will not go smoothly, especially if Trump wins in the Electoral College.

For example, a coalition of 50 left wing groups like the SEIU, AFT, Color of Change, Indivisible, MoveOn, and Demos is organising "mass public unrest," stating: "Occupy and hold space and shut things down, not just on Election Day but for weeks." They are coordinating their plans with the "Transition Integrity Project" (TIP) whose financial sponsors are unknown and whose leaders include John Podesta, longtime strategist for the Clinton family. TIP reported in August that it had "war gamed" four election crisis scenarios, each scenario resulting in street violence and a political impasse -- even if Biden wins. They stated, "Yes, expect violence in the aftermath of the election, because now that is the new 'normal.' Trump made us do it. He made us take the election, because the old, regular system just cannot be relied upon. That's why we had to publish our report, so we could organise 'around' all of the regular processes. Obama promised 'fundamental transformation,' and now, years later – we're finally going to deliver." Hillary Clinton has added that Biden "should not concede under any circumstances."

Watch this election and its aftermath closely. It will profoundly affect the United States and, inevitably, the entire world.

Photo: via author

Kamala Harris will be Joe Biden's running mate in the upcoming presidential elections.

Second-Line Gear: a First Role for Individual Fighting Power

Jan-Phillipp Weisswange

The second line of gear encompasses everything the soldier needs for fighting. This includes in particular the load carrying equipment for ammunition, water, radio and other equipment, as well as ballistic protection equipment.

Superior infantry defence technology can have a decisive effect in combat. In the Battle of Königgrätz on 3 July 1866, for example, the new Dreyse Needle Gun enabled Prussian infantrymen to achieve a three times faster rate of fire than the Lorenz rifle used by their Austrian opponents. The breech-loading rifle, designed by Johann Nikolaus von Dreyse, could also be reloaded in the prone position, whereas the Austrian Lorenz riflemen had to reload their percussion type muzzle-loaders either in the kneeling position or even standing.

Admittedly, a higher rate of fire also meant a reevaluation of the ammunition supply to the front line. And this is where the importance of the Second Line of Gear comes into play. The infantryman is not only equipped with a rifle as the main weapon, but also the load carrying equipment for the associated ammunition. If the Prussian needle gun riflemen had not had enough ammunition at hand, or if the ammunition in their pouches had been damaged during marching and thus rendered useless, the Lorenz rifle would have been able to exploit its superior range by a good third as an advantage.

Photo: MoD Norway

Everything on the man!

Supporting Role

The load carrying equipment expert Alfred A. Kruk has already pointed out the often underestimated importance of ammunition carrying devices in his standard work "Patronentaschen, Patronengurte und Banduliere 1850-1950". His book covers over 430 examples of various cartridge carriers from 36 countries over this one-hundred year period, illustrating the inventiveness that went into the design of these pieces of equipment.

The fundamental importance of the Second Line of Gear has not changed. However, weapon technology, tactics and materials have all changed. For example, at the beginning of the Cold War, the quick-reloading magazine became the standard for handguns. In the past, leather, sheet metal and plywood were the most commonly used materials for carrying equipment, and from about 1900 onwards, especially in the USA and Great Britain, woven materials were used. Today, plastics such as Cordura fabric or stiff materials such as Kydex are used in large quantities.

The soft ballistic flak jackets that appeared in the 1960s/1970s have developed considerably. Meanwhile, soft and hard ballistic materials, or stand-alone plates offer protection against small-arms fire. A fundamental question in equipment design is therefore whether to separate or combine ballistic protection and carrying equipment. Both variants may prove to be either tactically expedient or less beneficial. The advantage of separation is that ammunition and other equipment remain on the soldier when the ballistic protection is discarded as a tactical necessity - effect before cover! The advantage of combination solutions is that you have protection and carrying equipment at your fingertips in one go.

The increased importance of the pistol represents another significant change. Today the pistol is widely used as a "back-up weapon" for all infantry and dismounted operating soldiers, but also for other types of troops. A pistol holster must therefore be available on the carrying equipment.

Author

Dr. Jan-P. Weisswange is a Lieutenant Colonel (Reserve) of the German Army Reconnaissance and Intelligence Corps. He works full-time as a PR consultant in the defence industry. This article reflects his personal opinion.

Basic Requirements

The Second Line of Gear depends on the intended use and thus on the armament and equipment of the individual soldier. Basically, it must fulfil the following requirements:

- Safe and tactical storage space; the soldier must be able to carry as much ammunition as possible and other important ordnance and equipment. Ammunition and equipment must be able to be stored safely from loss and adverse weather, but at the same time be quickly accessible.
- High ergonomics; the equipment must be ergonomically wearable, and not cause any chafing, etc. It must be easy to use and be adapted to the use of the armament and other equipment of the First and Third Line of Gear. The rucksack should be mentioned here in particular. Another aspect of ergonomics is that the equipment must be able to be carried in the respective means of transport - be it land, air or sea vehicles.
- Protective properties; independent of ballistic protection, these include, for example, camouflage, even from night vision technology, low flammability, protection from secondary splinters and the quick and easy possibility of decontamination. Likewise, the equipment should have as little surface area as possible in order to avoid detection, for example, in a vehicle or on the battlefield. Finally, it should also be easy to put on and take off quickly, not least in terms of tactical combat casualty care.

Photo: Jan-P. Weisswange

Combined ballistic protection and carrying equipment as well as combat clothing by Hexonia

Universal or Modular?

As already mentioned, the individual equipment depends on the role being performed by the soldier. It must therefore be either as universal as possible, or as modular as possible. The British demonstrated the first approach to the greatest possible universality with their Model 1937 infantry equipment; it basically comprised two spacious universal pouches in which cartridge boxes, hand grenades or magazines for the Bren machine gun could be transported - depending on how the soldier was armed. Modularity, in turn, was achieved through additional carrying containers. Many older Bundeswehr soldiers can surely still remember the earlier approaches to this approach with shivers: magazine pouches, canteen, 'bread bag' (a small individual field pack), entrenching tool, and possibly also a combat knife were all looped onto the belt with the belt carrier attached to it via aluminium adapters (the author still considers the useless hook-in unpadded belt carrier to be a criminal offence). The carrying strap of the CBRN respirator case ran across the chest and back; this was the standard. In the opposite direction, the carrying strap of the signal pistol or the map case were possibly added. But that was not all; if you were carrying the SEM-52 radio or binoculars, you had to tighten additional straps around your upper body. Then there was also the backpack. While laced up like an Easter ham, you were still expected to be able to fight. The situation was only slightly improved with the Koppeltragesystem (Load Bearing Equipment) 95, which was slowly introduced in the 1990s.

Modern Belt and Load Bearing Equipment Systems

Belt and belt-carrying suspenders remain a classic model and are still in use worldwide. In this variation, the ballistic protection is worn separately. If the soldier carries a pistol, it must either be stored in the belt or carried in a thigh holster on a separate trouser belt.

Photo: Jan-P. Weisswange

Armament and protective equipment then and now - shown by the system house NFM.

Photo: Jan-P. Weisswange

Modular tactical clothing and equipment from Mehler Vario System and Lindnerhof-Tactics

The Bundeswehr still uses the Koppeltragesystem 95 as cross-sectional equipment. However, this is only because the privatisation of the uniform and personal equipment supply, as well as other factors have caused so much friction that modernisation in recent years has been piecemeal at best. Consequently, individual branches of the Bundeswehr have significantly more modern equipment than others.

Photos: Jan-P. Weisswange

The tactical baggage car WILD GOOSE 4x4 by Marom Dolphin with a load capacity of up to 120 kg.

PLCE are offered by Genuine Jayjays Ltd., for example. The family-owned company, based in Brecon, Wales, offers both carrying systems with permanently stitched pockets and modular versions. Permanently stitched pockets save weight and offer more pockets even with short belt length. This means that even slim soldiers have more stowage options available.
Many load carrying systems are only partially compatible with each other. Since the beginning of this millennium, however, the standard of the Pouch Attachment Ladder System (PALS) of the US-American Modular Lightweight Load-Carrying Equipment (MOLLE) has established itself worldwide. The PALS braid, which can be used to attach the equipment bags, can either be stitched onto the equipment carrier or cut into the outer material.

Combat Vests without Ballistic Protection

Combat vests now offer higher comfort levels and more storage space than conventional belt carrying systems. Among the earliest versions were ammunition carrying vests for 40mm grenade launchers, such as those issued by the USA. In the 1970s, individual soldiers fighting in the Rhodesian Bush War, created special assault vests. The paratroopers of the German Democratic Republic's National People's Army were also given special combat clothing, including a combat vest (the author had the pleasure of being introduced to one of the co-developers of this equipment).

CCG combat vest adapted for use in the German armed forces by German and Danish "Geardo" reservists

Chicom Chest-Rig (top) and ATXS Chest-Rig Vorauskräfte (bottom)

Battle Belt from Lindnerhof with Rigger Belt and personal safety line from MD-Textil, IFAK from S.O.Tech, Holster from Safariland, Knife from Oberland Arms

German armed forces ' load bearing equipment at the end of the Cold War

At least the Koppeltragesystem 95 can be credited with the fact that it can be adapted in a modular way and the pouches for additional equipment are compatible. Thankfully, the Easter ham phenomenon mentioned above no longer exists. Instead, the Koppeltragesystem 95 can be put on and taken off quickly, similar to a combat vest.
Nevertheless, it had already fallen far behind other designs at the time of its introduction. The USA had already set high standards since 1973 with the All Purpose Lightweight Individual Carrying Equipment (A.L.I.C.E.). The British Personal Load Carrying Equipment (PLCE), introduced in 1989, is probably one of the best designed systems of this kind to date. Modified versions of the British

Chest Rigs

Chest rigs are used for carrying ammunition and other equipment on the front of the chest. They are also worn separately from the ballistic protection equipment. Appropriate equipment tailored to the Soviet Kalashnikov assault rifle was in-

Bundeswehr Koppeltrageystem 95 load bearing equipment configured for the new shooting training concept

troduced in the 1960s in the Asian theatres of war on the communist side which were later also supplied to other insurgent movements - for example in Africa. Here too, the Rhodesian and South African Armed Forces were among the first to adapt this design for Western armaments and equipment. The British supplier Arktis Ltd. and other suppliers followed suit and produced similar products. In the German Bundeswehr, the Arktis SBS-Rig, marketed by Survival Equipment, and the Chestrig Vorauskräfte (Forward Forces) of the ATXS company, were among the most widespread items of equipment of this type.
Chest rigs are particularly suitable for crews of combat vehicles or for soldiers who have to carry large backpacks, such as long-range reconnaissance scouts, etc. There are models with permanently stitched pockets, as well as partial and fully modular versions. A further distinction is made between one-piece and two-piece models. The latter 'split-front chest rigs' can be opened at the front, which is advantageous for gliding or for tactical combat casualty care. Tactical Tailor and Lindnerhof-Taktik introduced such a model onto the market at the end of the 2000s.

Combined Ballistic Protection and Carrying Equipment

Combined ballistic protection and carrying equipment became commonplace by the mid-2000s at the latest. They usually consist of a vest with soft ballistic protection packages, front and back pockets for hard ballistic SAPI plates and PALS braiding for various equipment pouches. The first products of this kind were the Combat Integrated Releasable Armor System (CIRAS) from Eagle Industries (today a subsidiary of Vista Outdoor with Blackhawk, CamelBak and other well-known brands), the LBT Modular Plate Carrier 6094, or various models from the Israeli manufacturer Marom Dolphin.
In order to reduce weight and packing size and to increase mobility, the somewhat more minimalist Plate Carriers were developed later. They accommodate either stand-alone hard ballistic plates or combined hard and soft ballistics at the front and back. A cummerbund connects the plate compartments and can also be fitted with protective packages if required. Pouches for magazines and other equipment can also be attached.

Battle Belt

Except for the classic belt carrying system, most other equipment carriers can be carried in combination with a battle belt. For example, the pistol holster, spare magazines for the pistol, a dump pouch and an individual first aid kit are attached here. If a certified rappelling harness is looped into the battle belt, the equipment worn on it can supplement a safety line with carabiners. With this fitted, the wearer can be attached in certain situations, for example, in order not to fall out of the aircraft during tactical flight manoeuvres.

A Wide Field

Nearly all well-known manufacturers and some smaller companies also offer an incredible range of this type of equipment. Among the system suppliers for complete clothing and equipment systems are Crye Precision, Condor, 5.11, Gruppa 99 (part of the Kalashnikov Group), HelikonTex, Hexonia, Mehler (with

Masthead

European Security & Defence
Issue 10/2020, October 2020
ISSN 1617-7983 · www.euro-sd.com

Published by

Mittler Report Verlag GmbH
A company of the TAMM Media Group

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Layout:
CREATIV.CONSULTING GmbH, Germany

Production:
Lehmann Offsetdruck GmbH
22848 Norderstedt, Germany

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Cover photo: Rheinmetall

Annual subscription rate: €82.50 incl. postage

Reduced annual subscription rate for national distribution in Germany: €64.90 incl. postage

Photo: MoD Norway

The configuration of the individual combat equipment depends on the warfighter's role and armament. Norwegian infantrymen with combined ballistic protection and carrying equipment.

Lindnerhof Taktik and UfPro), Marom Dolphin, the NFM Group, Tasmanian Tiger or Vista Outdoor (with Eagle and Blackhawk). Hexonia, Mehler and NFM also offer ballistic head protection from their own company. NFM has named its portfolio after traditional Scandinavian names: Garm clothing, Hjelm head protection, Thor carrying systems and Skjold ballistic protection. Other manufacturers with well thought-out solutions include Black Lion Gear, Direct Action, First Spear, LBT, MD Textil, Sioen, Snigel Design, S.O.Tech, Source, SR Tactical, Stratagem, Templars Gear, Warrior Assault Systems or Centauron, and the list could certainly go on.

Systems suppliers to the armed forces currently include Source Tactical Gear, which supplies the Virtus soldier system to the British Armed Forces. Central to this is the Scaleable Tactical Vest, which can be adapted to different tasks and threat levels. Thanks to the Dynamic Weight Distribution (DWD) system, the hip belt can be connected to the waistcoat in order to reduce the load.

The Bundeswehr is currently introducing the Modular Ballistic Protection and Carrying System (Modulare ballistische Schutz- und Trageausstattung or MOBAST). It comprises clothing and equipment. The protective vest produced by Mehler features both soft and hard ballistic protection and separate stab protection. Additional elements provide splinter protection for the shoulder and neck area, upper arms, abdomen and thighs.

An optional hip belt system transfers a significant part of the weight of the vest and attached equipment to the pelvis and thereby relieves pressure on the shoulders and spine. Furthermore, an extensive set of pouches from Linderhof and Tasmanian Tiger is included in the delivery scope.

Photo: US Army

Green Berets of the 10th SFG (A) with plate carriers and battle belts

Photo: MoD UK

The British armed forces are currently fielding the VIRTUS soldier system.

Outlook

The special importance of modern clothing and equipment for the individual soldier cannot be overestimated; it not only increases individual fighting power, but also contributes to a positive external effect. This, in turn, has a positive effect on the acceptance of the armed services and on recruitment. Compared to other major armament projects, this effect costs "peanuts" and not only professional armies, but also conscript and militia forces have come to this conclusion, with Norway, Sweden and Switzerland being more recent examples.

European "Eyes in the Sky" and in Space

Doug Richardson

Drive along country roads to the southeast of the French town of Domme in the Dordogne – a fine example of a bastide (fortified medieval town) – and your eye might be caught by the sight of more modern military technology in the form of a major "antenna farm".

You will also notice regularly-spaced roadside signs warning 'TERRAIN MILITAIRE - DEFENSE DE PENETRER ET DE PHOTOGRAPHIER'.
But type 'antennas domme france' into an internet search engine, and you find not only photographs of the facility, but also an explanation of its purpose. France's General Directorate for External Security (DGSE) intelligence service may want to conceal details of the site and its purpose, but the facility's role is well-known to aficionados of the world of intelligence gathering. Similar land-based signal intelligence gathering (SIGINT) sites are operated by several NATO nations, but their existence is usually unpublicised, as are details of the equipment that they operate.
Aircraft, unmanned air vehicles, spacecraft, ships, and ground vehicles equipped for signal intelligence gathering (SIGINT) were the subject of an article 'The Art of Electronic Eavesdropping' in the 9/2020 issue of European Security & Defence, so the current article will focus on other classes of intelligence-gathering hardware.
The traditional approach to tactical reconnaissance was a dedicated version of a front-line fighter. One of the classic NATO reconnaissance fighters was the McDonnell Douglas RF-4, different versions of which were used by the US, Germany, Greece, Spain, and Turkey. Another was the Dassault Breguet MIRAGE IIIR or IIIRD, which the MIRAGE IIIE airframe with a custom-designed nose fitted with an array of cameras.
When the next generation of fighters were fielded, few included dedicated reconnaissance variants, though the UK operated a GR.1A reconnaissance version of the Panavia TORNADO (later updated to the GR.4A standard). This carried an internally-mounted TORNADO Infra-Red Reconnaissance System (TIRRS) in the location normally used by the aircraft's cannon.

Photo: RSwAF

This now-retired Saab SH 37 VIGGEN illustrates what was for many decades the traditional tool for tactical reconnaissance – a custom designed variant of an existing fighter with a nose configured to house cameras and other sensors rather than the normal nose-mounted radar.

Reconnaissance Pods

In today's world of ever more expensive combat aircraft deployed in ever-smaller numbers, having dedicated reconnaissance fighters is no longer possible. The most common solution is an external reconnaissance pod carried by an unmodified fighter – an arrangement that inevitably has an effect on the aircraft's performance, and reduces the number of weapons it can carry. Two examples will illustrate typical examples.
Italy equipped some of its AMX ACOL (Aggionamento Capacità Operative e Logistiche) fighters with the Rafael RecceLite pod. This houses a 0.7 degree FOV 3-5 micron FLIR, an Imager Handling Unit, an INS, a digital flight recorder, and a datalink.
Originally developed by Vinten, the Thales Optronics first entered service in the 1990s as the JAGUAR Replacement Reconnaissance Pod, but was later used on other aircraft, and is now designated the Digital Joint Reconnaissance Pod. Its most recent application was on the Saab GRIPENs of the South African Air Force. The pod contains an EO sensor, an IR sensor, and two recording modules.
Although the US still operates the Lockheed Martin U-2S high-altitude reconnaissance aircraft, the only European country to operate this class of aircraft was the UK. When the Royal Air Force's ageing fleet of Canberra PR.9s was retired in 2006, three were purchased by a UK civilian company. There were rumours that these aircraft would be fitted out with modern digital reconnaissance sensors, but the company was dissolved in 2017.

UAVs

Many of the traditional tasks of these high-flying platforms can now be handled by the Northrop Grumman RQ-4 GLOBAL HAWK unmanned air vehicle (UAV). This uses high-resolution synthetic aperture radar (SAR) and long-range electro-optical/infrared (EO/IR) sensors, and can maintain longer loiter times over target areas than were possible with the U-2S.
The USN had its own requirement for what it termed the Broad Area Maritime Surveillance (BAMS) programme, and in 2008 it had awarded Northrop Grumman a con-

Author

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tract to develop what became the MQ-4C TRITON. This was based on the RQ-4 GLOBAL HAWK, but had features intended to optimise it for the new role. The airframe and wings were reinforced, and the vehicle was fitted with de-icing and lightning protection systems that would allow it to descend through heavy cloud layers in order to more closely observe subjects of interest. Initial Operational Capability (IOC) for the MQ-4C was achieved in 2018.

In 2001, Germany ordered a customised RQ-4 variant to be designated EURO HAWK. The first example flew in June 2010, and the first delivery followed in July 2011. Unfortunately, the programme hit problems caused by the need for the UAV to be meet the certification requirements needed to allow it to fly in European airspace. This would have involved fitting each air vehicle with an anti-collision subsystem. The likely cost of achieving certification was reported to be more than €600M, and in May 2013 Germany terminated the programme.

Despite this setback, the European NATO allies were still interested in the RQ-4, so Bulgaria, Czech Republic, Denmark, Estonia, Germany, Italy, Latvia, Lithuania, Luxembourg, Norway, Poland, Romania, Slovakia, Slovenia and the US set up the Alliance Ground Surveillance programme to field a European GLOBAL HAWK force. On 4 June 2015, the first example of the resulting RQ-4D was unveiled. This flew in December of that year, and was delivered on 21 November 2019. It has since been followed by three more, with the fourth and latest arriving on 29 July 2020. All five will be based at Sigonella Air Base in Italy.

Photo: UK MoD

An external sensor pod can be fitted to a standard fighter in order to gather tactical intelligence. The massive size of pod seen here under a Panavia TORNADO was dictated by the need to carry Raytheon's DB-110, one of the longest focal-length cameras currently used for aerial reconnaissance.

Photo: Northrop Grumman

NATO plans to operate a fleet of five Northrop Grumman RQ-4D unmanned air vehicles.

Photo: UK MoD

The UK's WATCHKEEPER UAV is based on the Elbit H450.

While many armed forces operate short-range UAVs for immediate tactical reconnaissance, larger and heavier UAVs must be used to handle tasks for which the small fleet of NATO Alliance Ground Surveillance UAVs may not be suitable.

Although the US made extensive use of the General Atomics MQ-1 PREDATOR to support operations involving Afghanistan, the Balkans, Iraq, Iran, Libya, Pakistan, Somalia, and Syria, and Yemen, it no longer operates the type. However, PREDATOR is still in service with the Italian and Turkish Air Forces. PREDATOR is powered by a piston engine, but the larger and heavier General Atomics MQ-9 REAPER uses a turboprop engine. It has been used by the USAF in operations over Afghanistan, Iraq, Somalia, Libya, and Mali. Other NATO users are Belgium, France, Italy, Netherlands, Spain, and the UK.

The IAI HERON (MACHATZ-1) medium-altitude long-endurance UAV has been used by several NATO nations – Canada, Germany, Greece, Turkey, and the US. In some cases, the system was leased rather than purchased.

The UK was the only nation to operate the GEC Marconi (later BAe Systems) PHOENIX UAV. This had a long and troubled development phase and finally entered service in 1999. Its retirement less than a decade later probably went unmourned, as the UK began to operate Elbit H450 UAVs supplied under a leasing contract by Thales/Elbit consortium. A total of 52 were used in Afghanistan. These proved successful, and were worked hard, but 11 had crashed by 2013. In response to a question raised con-

cerning these crashes, the UK Parliament was told that "several changes have already been made to unmanned aerial systems training to increase airmanship standards in a number of areas". The H450 formed the basis of the Thales/Elbit WATCHKEEPER WK450 system, which entered service in Afghanistan in 2014. While the HERMES 450 carried an electro-optical/infrared sensor, the WK450 also had a dual-mode synthetic aperture radar and ground moving target indication system.
Some NATO nations have developed their own surveillance UAVs. For example, the Hellenic Air Force uses the Hellenic Aerospace Industry PEGASUS. The second-generation PEGASUS II was introduced in 2005. It can carry a maximum payload weight of 50 kg and has an endurance of up to 15 hours.

Threats to UAVs

In a world where manned intelligence-gathering aircraft may have a poor change of survival if faced with modern air defences, can a UAV do better? During recent combat operations, UAVs faced infrared-guided man-portable missiles, light anti-aircraft artillery, and small-arms fire. But at the 2014 European EW conference in Edinburgh, one presenter suggested that unless measures were taken to improve platform survivability, UAV operations might not be viable if the enemy forces had deployed radar-guided surface-to-air missile (SAM) systems.
The full study on which this presentation was based is classified, but the unclassified version looked at two scenarios. One involved the search for SA-6 or SA-8 systems that could threaten operations from a specific airfield, while the other was a search for SA-11 or SA-22 deployments.

Photo: Airbus

This view of the Le Bourget airport that hosts the bi-annual Paris Air Show was captured by a PLÉIADES satellite.

The presentation claimed that UAVs tasked with these missions were unlikely to survive. It considered three potential solutions – equipping the UAV with a sensor payload able to capture the required imagery from a greater stand-off range, using simple countermeasures such as chaff and hard manoeuvres, and the use of stand-off and self-protection jamming. Chaff and manoeuvres were seen as being of limited usefulness, while the weight of a self-protection jamming suite would rule out this solution for the smaller classes and would be useful against only one threat at a time. A long-range camera such as the Raytheon DB-110 would provide useful results at longer ranges, but would be of limited usefulness against some classes of target.
Several incidents involving Iran tend to conform this pessimistic view on UAV survivability. In December 2011, Iran displayed a Lockheed Martin RQ-170 SENTINEL UAV that it claimed to

Graphic: OHB System

The SAR-Lupe system consists of five radar reconnaissance satellites, each weighing approximately 720 kg, and a ground segment used to control the satellites and receive image data.

have downed near the city of Kashmar in northeastern Iran by using cyberwarfare techniques.

In June 2019, the US claimed that Iran had tried unsuccessfully to shoot down an MQ-9 flying over the Gulf of Oman by firing what US Central Command described as "a modified Iranian SA-7 surface-to-air missile". Radar-guided weapons seem to have been more effective; MQ-9s were shot down by Houthi air-defence systems in October 2017, June 2019, August 2019, and November 2019. The weapon responsible in 2017 has not been identified, but the 2019 losses were caused by an SA-6, a FATER-1 (improved SA-6), and a PANTSIR gun/missile system.

The most recent UAV losses were two REAPERs that the US DoD announced as being the result of a mid-air collision over Syria on 18 August 2020, but local new reports have suggested that at least one had been might have been shot down by Syrian opposition rebel fighters or by Turkish forces.

A more serious incident took place on 20 June 2019, when Iran shot down a US GLOBAL HAWK-class UAV. According to Iran, this had been done using an indigenously developed 3rd KHORDAD missile – an Iranian system that seems to be a derivative of the Russian BUK-M2. GLOBAL HAWK is equipped with a Raytheon AN/ALR-89 self-protection suite, which teams an AN/ALR-90 pulsed Radar Warning Receiver (RWR), AN/AVR-3 Laser Warning System, AN/APR-49 Radar Warning Receiver, an unspecified jamming system, and the AN/ALE-50 towed decoy system. However, the UAV downed by Iran was not an MQ-4C TRITON, but a Broad Area Maritime Surveillance-Demonstrator (BAMS-D) prototype that was being used by the USN, so it is not known whether it carried a defensive EW system.

Space-based Reconnaissance

For more than 40 years, the US has used spacecraft able to capture high-resolution ground images, and send these to earth stations via a radio link. The programme remains highly classified, although various designations such as KH-11, KH-12, Kennan, and Evolved Enhanced CRYSTAL have been reported.

Several of the European NATO allies operate less ambitious reconnaissance-satellite systems. Italy and Spain collaborated with France to develop the HELIOS IA and HELIOS 1B optical observation satellites, launched in July 1995 and December 1999 respectively. Based on the civil SPOT imaging satellites, these had a ground resolution of 1 metre.

They were followed by the HELIOS 2A and HELIOS 2B, which were launched in 2004 and 2009 respectively. Developed as a joint venture by France, Belgium, Greece, and Spain, these operated via a user ground segment that had been commissioned in 2003.

The PLÉIADES System

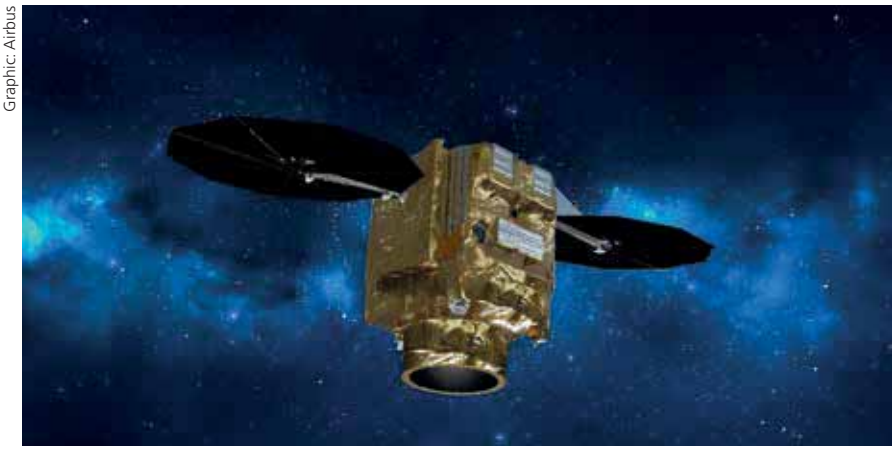
In 2011-12, the French-Italian PLÉIADES system was launched to meet civil and military requirements. This was based on two 970 kg satellites for which EADS ASTRIUM acted as prime contractor. The PLÉIADES-HR 1A and PLÉIADES-HR 1B spacecraft had a panchromatic resolution of 50 cm, and a multispectral resolution of 2 metre.

2018 saw launch of the first Composante Spatiale Optique (CSO), a French spacecraft intended to replace the HELIOS 2 satellites. A constellation of three is planned, each with a weight of 3,500 kg, and Germany contributed €200M to the cost of the third in exchange for receiving access rights to CSO imagery. All three were built by Airbus Defence and Space, and incorporate an optical payload from Thales Alenia Space. The first was designed to have a ground resolution of around 35 cm from its orbital height of 480 km, but the second will be in a 480 km orbit that will provide a ground resolution of around 20 cm.

Under a treaty signed in 2002, France and Germany agreed to co-operate on space-based reconnaissance. The German contribution to the space-based assets would be a constellation of five SAR-Lupe satellites launched between 2006 and 2008. The five satellites operate in three 500 km orbits in planes roughly sixty degrees apart. Each carries an X-band radar whose three-metre diameter antenna provided a 'spotlight resolution' of about 50 cm.

These are due to be replaced by the SARah constellation of one active phased array-antenna satellite built by EADS Astrium and two passive reflector-antenna satellites provided by OHB-System. This will have a higher ground resolution than the SAR-Lupe system.

Launched between 2007 and 2010, Italy's COSMO-SkyMed (COnstellation of small Satellites for Mediterranean basin Observation) is constellation of four dual-use (military and civil) satellites equipped with an X-band multi-mode high-resolution Synthetic Aperture Radar (SAR). ■



Graphic: Airbus

Airbus has funded, manufactured, and will own and operate two PLÉIADES Neo imaging satellites designed to offer a 30cm ground resolution.

On a Growth Trajectory: Lockheed Martin Ventures into Eastern Europe

Photo: Anatol Kotte

Dr. Dennis Göge, Vice President Lockheed Martin for Central and Eastern Europe

At a time when many European governments feel urged to increase their defence budgets, the largest US defence company is busy searching for opportunities. ESD had the opportunity to talk to Dr Dennis Göge, Vice President Lockheed Martin for Central and Eastern Europe.

ESD: Dr Göge, you started as Vice President of Central and Eastern Europe (CEE) at Lockheed Martin (LM) almost coincidentally with the lockdown caused by the COVID-19 pandemic. A challenge?
Göge: Indeed – like for so many of us. Fortunately, I was able to complete my US induction tour right in time and could familiarise myself with the remarkable company portfolio first-hand. Right after, it was literally 'working from home'. I met most of my new team, which is spread across Europe, via video conferences. If traveling and keeping close personal relations with partners and customers is part of your daily routine, this is obviously an odd situation. But I was even more impressed by how well the company has navigated through the pandemic so far, with its leadership and employees quickly adapting to new and agile ways of working – always with the top priority for keeping everyone safe. LM hired more than 12,000 people since the pandemic has started and made it a priority to support around 7,700 of small business and 'at-risk' suppliers.
Personally, I had the chance to bring in both, my background as an engineer and as a senior leader by joining an enterprise task force in order to help managing the impact to our international orders planning.

ESD: Speaking of your background, where do you see the greatest relevance for the current role in your previous career?
Göge: While heading the Defense and Security business area at the German Aerospace Centre (DLR), my focus was on consulting as well as on program and innovation management more than on specific products. It might be surprising, but this background fits perfectly into my role at LM, where we also don't look at the customer's needs from a single product perspective but follow an integrated approach of connected capabilities, which allows us to identify and offer multi-domain solutions and better cost-based synergies. To set out a successful path for building business, we take in strategic considerations from the start: What technology and industry base is available for partnership in-country? Which capabilities can we develop together? My experiences as former advisor to the Munich Security Conference (MSC) or to the German Ministry of Defense help me to addressing these strategic questions, closely collaborating with a diverse team and my colleagues from LM business areas. However, the most important thing remains to always listen to the customer – true to the company's motto 'Your Mission is Ours'.

ESD: What markets are you responsible for and what is Lockheed Martin's overall business record in Europe?
Göge: LM has been experiencing strong growth internationally for some time now, with the European business led by Chief Executive Europe, Jonathan Hoyle, as a dynamic factor in particular. My role is a response to this, in order to meet the rapidly growing security interests in the region and to further build on business opportunities. I am responsible for a large number of markets, including 14 NATO and 11 EU member states. Among others, the D-A-CH region, Romania, Bulgaria, the Balkans and Baltics can be mentioned here. Despite geographical proximity, this is obviously a heterogenous region where one-size-fits-all solutions don't apply: In Switzerland, for example, a referendum is the prerequisite to any further decision on the procurement of new fighter jets. Here, we are offering the F-35A LIGHTNING-II, the world's only available 5th generation fighter aircraft as a successor model for the Swiss Air Force. In Eastern Europe, despite negative economic effects of COVID-19, we see stable or even increasing defense budgets – the threat perception posed by Russia is taken very seriously here. In this context, the US government's European Recapitalization Incentive Program (ERIP) plays a key role. It improves the NATO interoperability of equipment in-region by driving the replacement of Soviet legacy systems. Overall, a promising outlook that comes with certain requirements to provide economic and technological stimuli for these markets. Even more in times of COVID-19, where governments need to spend smart on defense.

ESD: What are these requirements?
Göge: We see a specific need in the region for strengthening the economy sustainably via high-value job creation, developing technology and by building local supply chains. LM is fully committed to deliver on these needs with a regional industrial development strategy, based on the com-

pany's many achievements to date: LM employs around 4,000 people at 50 locations across 19 European countries and indirectly supports over 20,000 European jobs by working together with more than 650 tier-1 suppliers. A great example is LM owned, Polish based company PZL Mielec, which is benefiting the region with local production capabilities, delivering products made in Europe – over 480 BLACK HAWK cabins have been built in Poland for global markets already. A cornerstone of the regional hub to support business in CEE and a potential blueprint for more to come. The partnership concept benefits both sides: digital capabilities and a well-trained (IT)-workforce in region are enabler to reach the goals mentioned above and a valuable resource for us to partner with.

ESD: You have mentioned BLACK HAWKs. What other programmes are you working on and what partnerships with national industries do they include?

Göge: The F-35 remains our largest growth opportunity – with about half of F-35 orders coming from countries outside the US – many of them from EU and/or NATO members such as Italy or Poland. In line with our commitment to lead on technology and innovation together with European partners, LM just announced its intention to work closely with Polish industry to develop a highly survivable Unmanned Aerial System (UAS), which would be fully interoperable with F-35 or advanced 4th generation fighter aircraft and would significantly enhance the precision strike capability of the total force.

In Germany, we are partnering with MBDA to provide TLVS, the next-generation air and missile defense platform to replace Germany's aging Patriot system. Being part of the competition for Germany's next heavy lift helicopter with the Sikorsky CH-53K, we are offering the platform with the best long-term value through advantages in lifecycle costs and capability. Sikorsky and Rheinmetall have built a strong team to ensure that training and sustainment will be carried out by the German aerospace industry.

We also continue to see an increased interest in the F-16 – for both new production and F-16V upgrades. The proven fighter jet has been selected by Slovakia and Bulgaria in its latest variant, while there are additional opportunities in Croatia and other countries. The aircraft's advanced 4th generation capabilities provide full interoperability with NATO requirements, allowing to stay ahead of evolving threats and being a potential pathway to the F-35. There are also strong opportunities with Romania, the Baltics and others considering BLACK HAWK helicopters. In Romania, LM owned PZL Mielec and local industry partner Romaero just renewed an MoU, committing the two companies to developing plans for a BLACK HAWK MRO and upgrade facility in Bucharest. This reflects our understanding of the customers' need for building up resilience by local MRO capabilities.

The F-16 Block 70/72 is the newest and most advanced F-16 variant.

Finally, there's a high demand in precision fire munitions and missile defense. Romania and Poland have already decided for our HIMARS system - a highly mobile variant of the Multiple Launch Rocket System (MLRS) family of launchers. Additionally, both countries and Germany are among 10 international customers, who have signed agreements to procure PAC-3 MSE high-velocity interceptors that defend against incoming threats, including tactical ballistic missiles, cruise missiles and aircraft.

ESD: Procurement contracts are increasingly combined with operational support service requirements. How is this a relevant business for Lockheed Martin?

Göge: The Product-as-a-Service trend plays a major role in the aerospace and defense industry. Manufacturers are shifting from selling a product to the value that the product delivers. LM is offering a wide range of Mission Readiness solutions to support customers in their goal for maximised product uptime at reduced costs. Pilot and maintenance training systems or services to optimise supply chains are some areas with strong growth. Digitization is key to all of this. The more flight training missions can be completed in our high-tech simulators or maintenance practice carried out completely virtual, the more time is freed up for the aircraft to fly. An example on logistics: LM's Sikorsky has been awarded with a contract to provide critically needed spare parts for the remainder of Germany's CH-53G fleet's service life. An integrated sustainment approach will allow for increased budget predictability and better cost forecasting for the fleet, as well as predictive analysis that will forecast demands, reducing the lead time on spare parts.

ESD: Thank you.

The interview was conducted by Jürgen Hensel.

Photos: Lockheed Martin

The CH-53K demonstrating air refuelling capabilities with a KC-130J tanker aircraft

Army-2020 Forum Held Despite COVID-19

Yury Laskin

The sixth International Military-Technical Forum "ARMY-2020" was held as planned between 23-29 becoming the first large scale defence-related exhibition and conference since Defexpo and the Singapore Airshow.

The ARMY-2020 organisers implement unprecedented measures due to the ongoing pandemic. All non-Russian visitors were required to prove they were free from the virus and underwent obligatory testing before being allowed entry. A strict mask-wearing regime was enforced at the show's grounds.

Photos: Yury Laskin

The BMP-3 IFV has been designated the MANUL. Its prime novelty is a front-located engine compartment with a UTD-32 engine of increased power up to 660 hp.

The Russian Armed Forces have been substantially modernised and upgraded thanks to the State Armament Programme (SAP 2018-2027) worth some 20 trillion rubles (over USD250Bn). Of this sum, 19 trillion rubles are earmarked for procurement, repair and development of armaments, military and special hardware, and one trillion rubles on the construction of associated infrastructure. Not surprisingly, Russian defence industries actively participated in the ARMY-2020 Forum came from 1,457 different enterprises and organisations and presented over 28,000 military and dual-use products. In addition to the participating Russian companies, the national pavilions of Belarus, Brazil, India, Kazakhstan and Uzbekistan were on display. Russia's main defence contractors were joined there were high-ranking delegations from PR China, India and Vietnam. Russian Defence Ministry officials stressed that the exhibition continued to break its own records on key indicators, including the number of contracts signed. ARMY-2020 saw more than 40 state contracts signed with 27 companies from the military-industrial complex to the tune of 1.16 trillion rubles. The details of many deals were not disclosed, however, Russia's Minister of Defence, General Sergei Shoigu, remarked that it was important that the Ministry "had moved on from just procuring single copies and small batches of equipment to signing large series contracts."

High-Precision Weapons

The High-Precision Weapons (HPW) exhibits again proved to be a highlight, showcasing the latest technological novelties. The Tula-based Shipunov KBP Instrument Design Bureau (a HPW subsidiary) showcased its new-generation HERMES missile system with an over-the-horizon range of 100 km. HERMES has an autonomous guidance system of the fire-and-forget type. The system includes a number of vehicles ranging from a command model, equipped with computers, panels and controls, plus communication and data transmitting equipment alongside several combat vehicles equipped with mobile launchers. Additionally, a transport-loading vehicle has an on-board stock of missiles, a crane and a reloading mechanism, in addition to a reconnaissance device with a UAV employed to provide round-the-clock target detection and laser illumination in all weather conditions. The missile itself is reported to have a maximum flight velocity of 1,300 m/s and is equipped with a HEF type warhead of 28 kg. The missile calibre is 210 mm in the booster stage and 130 mm at the warhead area. It is transported in a sealed container, 3,500 mm in length. The container weight is 130 kg, with six deployed per vehicle. The manufacturer also announced that the HERMES missiles can be launched from land-based, naval and aerial platforms, including strike UAVs. KBP used the ARMY-2020 Forum to show the HERMES on a light trailer in order to demonstrate an additional variant. Kurganmashzavod (part of HPW) presented a BMP-3 IFV, the MANUL, whose prime novelty is a front-located engine compartment with a UTD-32 engine of increased power up to 660 hp. The revolutionary engine position has resulted in a significantly increased level of protection against frontal strikes. The MANUL is also fitted with the TKB-945 unmanned combat module currently in use on the medium tracked and wheeled platforms KURGANETS-25 and BOOMERANG, as well as on the heavy BMP T-15 ARMATA. The module is armed with a 30 mm automatic cannon, a 7.62mm machine gun, and the KORNET anti-tank system capable of destroying all existing tanks. Due to the engine's frontal location, the troop compartment can now accommodate eight soldiers. According to the manufacturer, the new IFV is mainly intended for the export market, in particular for militaries already operating the BMP-3 vehicle, as

The new-generation HERMES missile has an over-the-horizon range of 100 km.

the degree of unification between the MANUL and the BMP-3 is 50%.

The ARMY-2020 Forum not only demonstrated Russia's strong position in traditional areas such as air defence, smart weapons, armoured vehicles, but it also showcased breakthroughs in a number of new technologies, drones in particular, something that Defence Minister Shoigu picked up on with companies promised large UAV contracts by the end of the year.

The ORION UAV was one of the Forum's highlights with the Russian MoD announcing it had signed the first serial contract for the supply of the ORION.. This completely indigenous heavy drone has already passed a significant part of its trials, including combat tests in Syria. Initially designed as a long-range aerial reconnaissance system, the UAV has since been modified to perform strike missions and was on display at the Forum with the full range of its payload, including missiles and bombs. The ORION is a medium-altitude long-endurance (MALE) unmanned vehicle, which has a normal aerodynamic scheme with a 16-metre wingspan in the middle and V-shaped tail fins. Its maximum take-off weight is 1,200 kg and it can fly for 24 hours at altitudes of 7,500 metres with a 200-kg payload. The manufacturers announced their plans to occupy a niche in the MALE-class UAV global market and signed an agreement on cooperation with Rosoboronexport. This major Russian exporter intends to promote other advanced unmanned aerial vehicles, including the GROM (Thunder), a high-speed strike UAV, with a maximum take-off weight of 7 tonnes and 2tonne payload.

Counter-Unmanned Aerial Systems

The latest examples of counter-unmanned aerial systems (C-UAS) were also among the highlights this year. They included Rubezh-Avtomatika, Bastion-Avtomatika and Kupol-PRO designs. Rubezh-Avtomatika is a new design with an intelligent control system designed to autonomously detect and neutralise drones, i.e., without any human involvement. It can be used both in the field and in urban environments, installed in open sites and on rooftops. The unit comprises radio reconnaissance and adaptive electronic jamming. The Kupol-PRO operates within a defined perimeter, covering designated territory with a kind of 'dome'. Though it has a shorter range (up to 2.5 km above the protected area), it is still highly mobile. Robotic anti-drone systems are capable of integrating with various weapon systems, for example, with the PANTSIR air defence missile system. Another novelty was the RAT multifunctional mobile system. The system was developed on the basis of a special armoured vehicle and is equipped with a full range of drone detection and suppression equipment to protect critical objects from unauthorised UAV intrusion. It includes a radar station, equipment for automatic recognition and suppression of telecommunication channels, a system of directed ultra-high frequency (microwave) suppression and a system of directed laser destruction. The RAT system can detect drones up to 3.5 km away and destroy them within a radius of up to 2.5 km.

The ORION UAV was one of the Forum's highlights.

More Debutants

Almaz-Antey Concern unveiled the ANTEY-4000, export version of the S-300V4 anti-aircraft missile system. The company displayed the 9A83M-2E launcher, 9A84M-1E launcher-loader vehicle and surface-to-air missiles (9M83ME and 9M82ME) capable of hitting 24 aerial targets simultaneously. The main improvement of the ANTEY-4000 over the previous ANTEY-2500 and S-300VM systems is the enhanced engagement envelope for all targets engaged by the system. Touted as a "fully digital" system, it is claimed to have a range of about 400 km.

The Ganichev Splav company displayed the 9M544 300-mm high-precision guided rocket projectile with HEAT-fragmentation warheads for the TORNADO-S MRLS with a range of up to 120 km. The new projectile has the weight and size characteristics of the standard projectiles for the SMERCH MRLS, but at the same time, it is significantly different in design. The classic rocket has a pin at the base and the guide has a screw groove. This ensures the rotation of the projectile when leaving the guide and stabilises the flight. The stabilisation of the new projectile is provided by the tail unit, and is controlled by four wings in the nose. The 9M544 projectile features a control system based on the SN398 inertial navigation system (INS) developed by the Pilyugin Scientific-Production Centre of Automation and Instrument Building. The control system includes high-tech devices originally created for the space industry. For example, the unit for measuring the angular velocity with an accelerometer is designed to operate as part of spacecraft motion control systems. Alexander Smirnov, Splav's CEO, claimed that the projectile was the first in a range of guided platforms opening up new opportunities for artillery units. ■

Integrating Capability and Affordability – Serbia's Armoured Vehicle Solution

David Saw

As the new Serbian state became a reality in June 2006, one of its most important assets was a highly capable defence industry. This industry was important not just because it provided the Serbian military with essential equipment and support, but also because of the major contribution defence exports and foreign currency make to the Serbian economy.

To continue meeting the needs of the Serbian military and to remain competitive in the defence export marketplace, the Serbian defence industry must continue to offer innovative solutions in terms of defence systems. They cannot being competitive in all system categories, so focus on areas that meet national needs and offer potential international success. These include small arms, mortars and their associated ammunition, missiles, artillery, both tube and rocket, and ammunition and now armoured vehicles, with the main system on offer being the LAZAR 3.

Serbian industry has achieved significant market penetration in Africa, the Middle East, South Asia and even in Europe, with the Cypriot National Guard acquiring 24 NORA-B52 155/52 mm self-propelled artillery systems. Penetrating export markets with wheeled armoured vehicles presents Serbian industry with a complex challenge due to the profusion of competing systems, but the Serbians can point to their international success in artillery systems, as a reference.

The Serbian defence industry is built on the foundations of the defence industry of the former Yugoslavia, and largely operates under the umbrella of Yugoimport SDPR. Due to its geo-strategic position, Yugoslavia was able to keep its independence and acquire defence equipment from both the West and the Soviet bloc. Experience gained in the operation and sustainment of these systems gave Yugoslavia a unique insight into different schools of equipment design, and has encouraged integration of components from, particularly, NATO countries including Ireland (Timoney), the UK (Tyron) and the USA (Cummins and Allison).

Photo: Yugoimport

The highly protected LAZAR 3 8x8

Indigenous armour programmes have been a reality since the mid-1950s, with the design and development of the OT M-60 tracked APC. Nearly 800 vehicles were built between 1962 and the end of the 1970s. These were followed by a new, more complex and higher performance tracked APC, the BVP M-80. This vehicle is still in service today in Serbia, with many chassis undergoing a SLEP modernisation programme. The next development came with the BOV wheeled armoured vehicle family in the 1980s, a nine tonne 4x4 vehicle, with a crew of two and eight dismounts in the APC version. Evolutions of the basic design were also developed.

All of this experience provided the basis for Serbia to embark on the development of modern wheeled armoured vehicles, the most important of which is the LAZAR 3, an 8x8 vehicle with a combat weight of between 24 and 26-28 tonnes, depending on the variant chosen. The engine is a Cummins ISM500 373 kW (500hp) diesel. Armament options range from an RCWS mounting a 12.7x108 mm NSV machine gun or similar, up to a turret system mounting a 2A42 30 mm cannon, 30 mm AG-17 AGL and a 7.62 mm PKTM co-ax.

There is also great emphasis on protection in the LAZAR 3. The vehicle applies a modular protection concept meaning that protection levels can be upscaled to meet customer requirements and protection is configured to meet NATO standards. The base-level protection plan is Level 3 STANAG 4569 all around the vehicle, the front of the vehicle is Level 3+, with anti-mine protection being Level 3A and Level 3B. Level 4 can be achieved all around the vehicle, with the front up to Level 5.

The LAZAR 3 is both performance and price competitive with equivalent systems in this market segment. Equally important is that while LAZAR 3 draws on a long legacy of successful armoured vehicle design, development and manufacture, it incorporates NATO standards that would permit easy integration into NATO orbats. ■

Cyberwarfare in Eastern Europe

Overview of Recent Cyber Operations in Eastern Europe

Joris Verbeurgt

In the month of August 2020 alone, Russian hackers attempted to discredit NATO among Polish, Lithuanian, and Latvian audiences by compromising news sites and replacing legitimate articles with falsified posts, and by using fabricated quotes from military and political officials.

At the same time, Ukrainian officials announced that a Russian hacking group had conducted a phishing campaign in preparation for operations on Ukraine's Independence Day on 24 August. In April, the Russian government was probably behind a series of cyber attacks on Poland's War Studies University with the aim of undermining US-Polish relations with a disinformation campaign. That same month, a Russian hacking group used forged diplomatic cables and planted articles on social media to undermine the Government of Estonia. By exploiting IT supply chains, a Russian hacking group infiltrated Burisma Holdings, a major Ukrainian natural gas producer where Hunter Biden, the son of US presidential candidate Joe Biden, was a board member until 2019. In that year, Russian government hackers targeted Ukrainian diplomats, government officials, military officers, law enforcement, journalists, and non-governmental organisations in a spear phishing campaign. Other incidents with Moscow-linked hacker-campaigns in Eastern Europe involve Poland, where in 2017 the Defence Ministry reported that it had repelled a Russian hacking attempt against companies in Poland for the third time. In that period, Russia also compromised the personal smartphones of NATO soldiers deployed to Poland and the Baltic states. In the last decade, unknown hackers used spoofed email addresses to conduct a disinformation campaign in Lithuania by spreading rumours of corruption allegedly committed by the Defence Minister. In Latvia, unidentified hackers broke into the tax records of government officials and posted their real incomes on the internet, which caused political turmoil. And in Estonia, government networks have been harassed by a denial of service attack by unknown foreign intruders, but most indications point to the Russian government as the perpetrator. Several government online services were temporarily disrupted and online banking was made impossible. Although these attacks had no crippling effect on the Estonian economy, they created a wave of fear in countries that rely heavily on IT-systems and infrastructures. The Czech Republic announced that the country's Foreign Ministry had been the victim of a cyber attack by an unspecified foreign state, later identified as Russia, in April 2019. In 2017, the Czech Foreign Ministry had already suffered a cyber attack from Russian intelligence services.

Photo: Pixabay

Attackers, sometimes referred to as 'hacktivists', can be individuals or groups who work for their own financial benefit or ideological cause.

The Russian Conception of Cyberwarfare

Cyber attacks can be defined as 'any type of offensive manoeuvre employed by individuals or whole organisations that target computer information systems, infrastructure, computer networks, and/or personal computer devices by various means of malicious acts, usually originating from an anonymous source that either steals, alters, or destroys a specified target by hacking into a susceptible system,' are more common than we think. Attackers can be individuals or groups who work for their own financial benefit or ideological cause (so-called hacktivism), or they can be state-sponsored. Once they have stealthily entered networks or systems, they can remain undetected for years and years. Government cyber espionage involves stealing information from, and about government institutions and organisations. Cyberwarfare involves politically motivated destructive attacks aimed at sabotage and espionage, and cyberwar is waged all over the globe: trained IT-experts who break into the computer information systems, infrastructure, computer networks, and/or personal computer devices of their targets. The US and Russia, but also China, India, North Korea and Israel are believed to have an impressive arsenal of offensive and defensive cyber weapons systems and tactics. For this article, we focus on cyberwarfare in Eastern Europe. It will come as no surprise that, from a NATO and European viewpoint, Russia is the main adversary in that region. Especially the three Baltic states, Estonia, Latvia and Lithuania, Poland, the Czech Republic and, of course, Ukraine, are the targets of Russian cyber actions. Moscow is convinced that the US and its European allies in NATO are constantly challenging, among others, Russia's security in the information realm. The free flow of information that the internet generates is seen as both a threat and an opportunity. However, the Russian military and security forces do not regard cyberwarfare as defined above (they do not even use the term). Instead, they see cyber operations within the broader framework of information warfare (propaganda), which inevitably in this day and age, includes computer net-

Photo: CCDCOE

In 2019, nine more nations joined the NATO Cooperative Cyber Defence Centre of Excellence. Founded in Tallinn in 2008 with seven members, the CCDCOE has a reported membership of 28 countries as of summer 2020.

work operations (CNO), electronic warfare (EW), psychological operations (PsyOps) and information operations (InfoOps). The struggle within 'information space' is perceived as an extension of conventional Russian military operations.

Although Russia was relatively slow in embracing cyberspace as a battlefield, it is now rapidly bolstering the defensive as well as the offensive cyber capabilities of its armed forces. Moscow regards cyberwarfare not as a distinctive kind of warfare, but more as an enabler of conventional forces. This was demonstrated during the short armed conflict with Georgia in 2008 and in the ongoing war with Ukraine that started in 2014. Russia seems to have stepped up cyber operations against Ukraine as from 2018: in December of that year, the Security Service of Ukraine blocked an attempt by the Russian special services to disrupt the information systems of Ukraine's judicial authority, right at the moment when a Kyiv court ruled that there was substantial evidence of Russian interference with the 2016 election campaign of Donald Trump to become president of the United States. Other Ukrainian government agencies, as well as multiple NATO members, were targeted in that same period by a cyber campaign from a Russia-linked group. In 2019, Ukrainian military and government organisations were hacked by a Russia-backed group operating from the so-called Luhansk People's Republic that declared independence from Ukraine in 2014.

Recent Developments

A central feature of Russia's offensive cyber operations in Eastern European countries is the use of 'hacktivists' and cyber criminal syndicates. They can easily be mobilised and their anonymity allows them to deny any complicity in a cyber attack. Already in the 1990s, Russia had developed a sophisticated cyber toolbox, mainly focused on cyber espionage. The cyber operations were 'outsourced' to informal actors like 'activists', 'patriotic hackers' and downright criminal organisations. Besides creating plausible deniability, the outsourcing of the cyber activities also reduced the operational and financial cost. Technically and financially, the informal actors rely on the Russian authorities, especially on the intelligence agencies. This low-cost and low-risk cyber strategy paid off, as proven by the already mentioned cyber attack on Estonia in 2007 and the hacking of a Ukrainian power plant in 2015. Recent developments within the Russian cyber and intelligence communities suggest that the Federal Security Service (FSB), an agency responsible for counter-intelligence and other aspects of state security, as well as intelligence gathering in foreign countries, will play a more central role in the Russian cyber strategy. Since the FSB reports directly to Russian president, Vladimir Putin, cyberspace has reached the highest levels of the Kremlin, thus underlining its importance for Russia. Not only is the FSB maintaining and operating the System for Operative Investigative Activities (SORM), Russia's internal cyber surveillance system, but its ambitions are more far-reaching: in the 2016 Information Security Doctrine, Russia claims "to deploy a national system of managing the Russian segment of the Internet". The term "Russian segment of the Internet" is understood to mean a purely domestic network which is disconnected from the global internet. RuNet, as the exclusively Russian internet is called, is fully state-controlled and must ensure a stronger defence against external attacks or threats. The architecture of RuNet is completely controlled by Russian state agencies inside Russia, allowing operational capabilities outside the global internet. The disconnection should take place in 2020, but it is doubtful whether this time schedule is realistic.

The fact that the FSB and other Russian security services like the MVD (the Internal Troops of the Ministry of Internal Affairs),

the FSO RF (Federal Protective Service of the Russian Federation) and the SVR (Russia's Foreign Intelligence Service) entered the cyber arena first, led to a reduced role for the Armed Forces in the fields of online propaganda and disinformation campaigns. A proposal from the Russian Ministry of Defence to establish a branch within the military for conducting InfoOps, with specially trained troops including hackers, journalists, linguists, specialists in strategic communications and in PsyOps, met with a njet from the FSB. Therefore, the Armed Forces operate more or less in the periphery of cyberspace, like in the field of EW. However, in 2013 the military announced that it had created the Foundation for Advanced Military Research, a cyber unit responsible for offensive and defensive cyber-operations, including research and development programmes to increase the use of cyber in support of conventional military operations.

Photo: Siemens

Because cyber attacks have become more prevalent due to digitalisation, cyber security training is becoming an essential part of securing and protecting assets. At a recent cyber defence exercise in Estonia, governments and industry partners including Siemens, collaborated with the NATO Cooperative Cyber Defence Centre of Excellence (NATO CCD COE) to train against cyber attacks.

NATO in Cyberspace

As tensions between NATO and Russia increase, and a state of conflict in the domains of intelligence, information warfare and cyberspace is rapidly growing, the EU and NATO seem hesitant about how to deal with this major new challenge. Russian cyber capabilities do not only deter, compel or disorient Eastern European NATO- and EU Member States, but they also disseminate pro-Russia propaganda. Popular support for adversary governments is constantly undermined through pro-Russian news media sites like Sputnik and RT (formerly Russia Today), by spreading adverse or misleading information on foreign governments, institutions and leaders via leaks of documents that are often obtained via cyber espionage, and by the use of internet "trolls", individuals who are paid to create fake blogs and ditto online profiles to spread pro-Russian viewpoints. All these new developments have lent a new urgency to the debate over cybersecurity in the West in general and in Eastern Europe in particular.

The US is less reluctant to confront Moscow in cyberspace: in 2018, President Trump authorised the CIA to conduct cyber operations against Iran, North Korea, Russia, and China. The operations included disruption and public leaking of information. And in July 2020, President Trump confirmed that he directly authorised a 2019 operation by US Cyber Command taking the Russian Internet Research Agency offline.

Under the current circumstances, NATO is eager to speed up its cyber adaptation process to confront the Russian threat. The NATO Cooperative Cyber Defence Centre of Excellence (CCDCOE) is a multinational and interdisciplinary cyber defence hub carrying out research, training and exercises in four core cyber areas: technology, strategy, operations and law. The CCDCOE supports NATO and its member nations with cyber defence expertise and fosters cooperation among the 28 contributing nations, among others the Baltic states, Bulgaria, the Czech Republic, Hungary, Poland, Romania and Slovakia. The group brings together researchers, analysts and educators from the military, government, academia and industry. This year, the Estonian capital of Tallinn hosted exercise "Locked Shields", in which the imaginary island nation of Berylia was attacked by hackers who targeted the nation's power grid and public-safety infrastructure, while cyber experts from across Europe worked to counter attacks. The simulation got as close as possible to real life, involving real network infrastructures and water-treatment systems. That such an attack is no fiction, was proven in May 2020 when German officials found that a Russian hacking group associated with the FSB had compromised the networks of energy, water, and power companies in Germany by exploiting IT supply chains.

Four individual Eastern European nations also heavily invest in countering the Russian cyber threat: Poland intends to hire and train thousands of cyber security experts to help implement its elaborated cyber security policy, aimed at four specific objectives: increased capacity for nationally coordinated actions to prevent, detect, combat and minimise the impact of incidents which compromise the security of ICT systems vital to the functioning of the state, enhanced capacity to counteract cyber threats, increasing the national potential and competence in the area of security in cyberspace and building a strong international position in the area of cyber security.

The Baltic states have learned some important lessons from Russia's use of cyberspace in its wars against Georgia and Ukraine. With the help of the US, the Baltic countries are stepping up their cyber defence to the level of cyber deterrence. The objective is to try to stay a step ahead of Russia by evolving from merely reactive and defensive measures, to producing a proactive cyber deterrence. A lot of work still needs to be done: capabilities to be built, budgets found and allocated, and a strong cooperation between the private and public sector, combining the resources and knowledge of both, established if the Baltic countries want to prevail in a future cyber confrontation with Russia.

Other Eastern European countries (like the EU as a whole) are developing strategies and concepts, but lag far behind Russia, which is already actively exploiting cyberspace for its own interests, and with a high degree of success. The Russians have understood that cyberwarfare, be it in combination with conventional warfare or not, is the weapon of the future. In this day and age, he who succeeds in winning the hearts and minds of the people, wins the war. That is a lesson that many European countries still need to learn. ■

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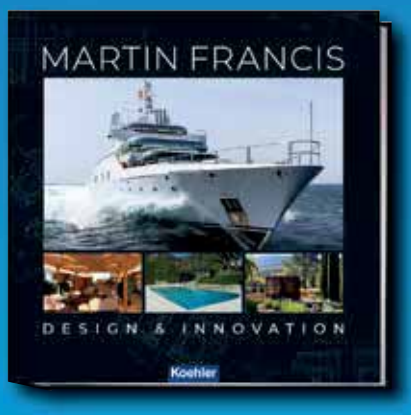

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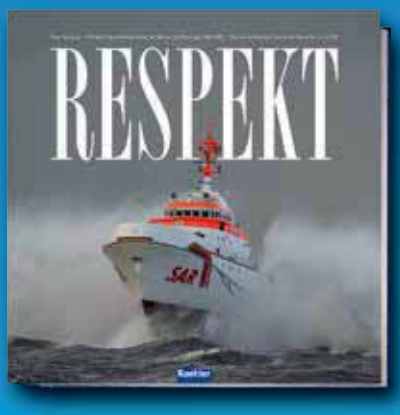

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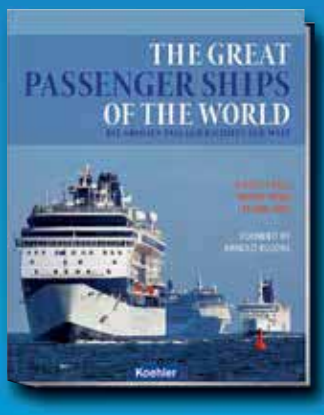

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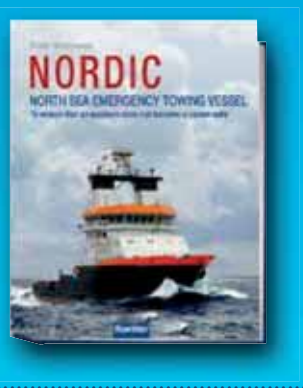

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Ten Years of Attacking IED Networks – Spanish-Based Centre of Excellence

Esteban Villarejo

The NATO-accredited Counter Improvised Explosive Devices Centre of Excellence (C-IED COE) is at the forefrontof combating the IED threat.

The Counter Improvised Explosive Devices Centre of Excellence (C-IED COE) celebrates its tenth anniversary this year. It was on 16 November 2010 when this Spanish-hosted international military facility received its accreditation as an education and training centre of the NATO Alliance.
In 2009, IEDs represented a clear and present danger for NATO and its coalition partners deployed in Afghanistan. That painful year saw as many as 7,228 IED attacks in Afghanistan, a 120% increase over numbers for 2008, and a record for the war. Of the 512 international soldiers killed in 2009, 448 were killed in action - 280 of those by IEDs.
When six NATO Member Countries signed the Memorandum of Understanding in Norfolk, Virginia, the Centre became one of 25 Centres of Excellence (COE), accredited by NATO, formally labelled a NATO Allied Command Transformation (ACT) institution.

Photos/Graphic: CIED COE

Currently, the Allied nations sponsoring the C-IED COE comprise the Czech Republic, France, Germany, Hungary, the Netherlands, Portugal, Romania, Turkey, the United States, with Spain as the framework and host nation, and Greece currently in the process of joining as another sponsoring nation; Sweden, as a non-NATO ally, is an additional contributing partner.

C-IED training in Jordan

After the 2010 Lisbon NATO Summit, the Alliance took the decision to promote the concept of C-IED COE in an attempt to tackle this dangerous and increasing threat from a 360° view. "The blast of an IED is only the symptom, the network is the illness. And we attack networks from here. In Afghanistan, Iraq, Asia or wherever a request might come from," the Director of the C-IED COE, Spanish Colonel José Antonio Cruz Moro told ESD during a recent visit to the facility, located near the mountains of Hoyo de Manzanares (45 km from Madrid).
"Prepare the force, attack the networks, and defeat the device" are the three pillars of an organisation that is based, of course, primarily on an understanding of the attackers and on intelligence. The C-IED COE's mission is "to provide subject matter expertise in order to support the Alliance, its partners, and the international community in the fight against IED and co-operate to increase security of Allied Nations and also all the troops deployed in theatres of operations, reducing or eliminating the threats from improvised explosive devices used or for use, in particular by terrorists or insurgents," explained Colonel Cruz Moro.
The Centre currently has 62 staff with 43 posts assigned to the three core branches (with the other 13 open to current and future sponsor nations). Spain, in the framework of providing host nation support, contributes 19 additional staff members, employed to provide the administration and support functions. "This group is crucial for the functioning of the C-IED COE," underlined Colonel Cruz Moro.
Spain also provides the highest number of posts engaged in the Centre's core activities, with 27 staff, followed by Germany and the US with three soldiers each. Other countries such as Canada, the United Kingdom, Italy and Australia have all shown interest in the past to participate in the project.
In order to fulfil its mission, the C-IED COE collaborates and cooperates with other organisations, both national and international, drawn from all the communities involved in the C-IED fight (military, law enforcement, intelligence, and academia). For example, the Spanish National Police, or Guardia Civil, have five posts and the Spanish National Intelligence Centre (CNI) has two. It is important to take into account that the fight against the terrorist group ETA was the driving force behind Spain's decision to launch its candidacy to host the C-IED COE.

The Centre aims to become a reference point in three main areas within the C-IED community:

- C-IED information sharing: through the coordination and merging of mil/non mil C-IED-related intel sources, improving multi-national information sharing and establishing/promoting intelligence forums. Intelligence is therefore the key component of the Centre's activity.
- Technology & Development: gathering information on current and emerging technology, and, simultaneously, confronting operational needs with technological solutions. It also supports the Conference of National Armaments Directors C-IED Materiel Roadmap in some of its initiatives.
- Training: coordinating international training efforts, avoiding duplication and identifying special training expertise.

As mentioned, the C-IED COE is structured in three main branches:

1. **Prepare the Force (eight international posts, led by Germany).** It comprises two sections: the C-IED Training Section and C-IED Lessons Learned Section. This branch deals with supporting the determination of requirements and objectives within the Alliance in the matter of multinational education, training and exercises. In the wider C-IED "community of interest", led by Headquarters Supreme Allied Commander Transformation (HQ SACT) in Norfolk, Virginia, the C-IED COE aims to support the harmonisation of allied C-IED training activities. In coordination with HQ SACT, the Centre also develops advanced multinational courses for C-IED experts dealing with doctrine, education and training, evaluation and C-IED lessons learned.
2. **Attack the Networks (15 posts, led by Spain).** This branch focuses its efforts on the development of initiatives in support of anticipatory analysis & effective planning for lethal/non-lethal engagement of networks; the understanding of the complex nature of threat networks and their interaction with neutral/friendly ones; the impulse to the widest inter-agency (military, law enforcement & security) approach against multifaceted cross-boundary threats from networks; and the highest amount of information sharing among the C-IED Community of Interest.
3. **Defeat the Device (14 posts, led by Turkey).** The branch analyses and compares common operational needs and possible technological solutions in order to identify capability gaps and requirements; IED technical analysis; supports technical exploitation studies; collects, maintains and provides information on C-IED techniques and technologies and analyses their limitations and potential.

The Director of the C-IED COE, Spanish Colonel José Antonio Cruz Moro

"Our objective is to spread the knowledge we gain at the Centre and to be on the ground providing real and practical techniques," stated Colonel Cruz Moro, Director of the C-IED COE since July 2018. Previously, during a six-month tour, he was appointed senior advisor for C-IED at the NATO training and capacity building mission in Iraq. "Mosul was one of those theatres where IEDs became more sophisticated," he explained. It goes without saying that the information related to any operation is confidential.

The Centre has provided reports on such vital topics as improvised batteries for MANPADs, fake detectors, introduction to the effects of explosions and blast injuries, route clearance package in C-IED operations, the role of women in the threat network and understanding the rising cult of the suicide bomber.

Lieutenant Colonel Javier Corbacho Margallo, Executive Officer of the C-IED COE, outlined to EDS the courses which the Centre is currently offering:

1. C-IED Staff Officer Course (CSOC): to provide C-IED staff officers and senior staff assistants, at upper tactical (LCC) and operational levels, with the knowledge and skills to facilitate, manage, and lead the C-IED effort, by drawing together and coordinating expertise and efforts of the other staff branches, and become the pri-

Photo: Aunav

The aunav NEO EOD/IED/CBRN robot with a variable geometry system which allows its width to be increased or decreased automatically in a few seconds

The C-IED COE supported Jordan, from June 2017 to December 2018 to develop capabilities against IEDs.

mary C-IED SME and operations advisor for commanders.
2. Counter IED Awareness Course (CIAC): to provide tactical and operational level HQ staff with an awareness of counter IED strategies and support activities that may be integrated into existing operational planning and structures.
3. Weapon Intelligence Team (WIT): the course's aim is to train personnel to collect, collate, assess, and disseminate information on enemy capabilities relating directly to their use of weapons, caches, finds, etc. The course specifically includes the investigation of IEDs, IED explosions, and the subsequent collection of explosive remnants, intelligence and information, ultimately leading to the provision of information used to defeat the IED network.
4. Basic IED Field Exploitation Course (BIFEC): to provide an overview of the execution of C-IED field exploitation. This includes technical and forensic field exploitation of IED events in order to obtain immediate intelligence and to preserve evidence for further investigation and legal processes.
5. Attack the Network Course (AtNOC): to provide NATO intelligence, operations, plans, counter terrorism and C-IED staff officers and senior staff assistants from the upper tactical (LCC, MCC, ACC, SOCC) and operational level commands with the knowledge and skills to integrate the comprehensive AtN approach across the other HQ processes. Emphasis will concentrate on providing AtN related situational awareness, recommending ways to engage all networks and an assessment on the engagement effects.
6. Document and Media Exploitation (DOMEX): to improve the training of personnel deployed on NATO operations in order to increase their technical skills regarding DOMEX in support of AtN.
7. Analyst's Notebook Users Course (ANUC): to familiarise analysts from military and law enforcement agencies with the Analyst Notebook tool and enable the user to work with this software.
8. Weapon Intelligence Team Train-the-Trainer Course (WIT T3): to improve NATO nations' capability to train their own forces in Level 1 technical exploitation (including WIT), by educating trainers to design and conduct courses by increasing teaching skills and improving technical knowledge.
9. ADL C-IED Awareness Course (online course): to provide tactical and operational level HQ staff with an awareness of counter IED strategies and support activities that may be integrated into existing operational planning and structures.

IEDs on display at the COE

Other training activities are related to the mobile advisory and training team; senior leadership seminar; and contribution to Defence Capability Building (DCB).

In this last item, for example, the C-IED COE supported non-NATO ally, Jordan, from June 2017 to December 2018 to develop capabilities against IEDs. The title of the project was "Comprehensive Package for Strengthening Jordanian C-IED Capabilities". In 2017, the project focused on the Jordanian national C-IED policy development, and in 2018 mainly on the tactical units' C-IED capability improvement. Tunisia and Iraq are other non-NATO countries which have received this kind of DCB support.

Before leaving the NATO C-IED Centre of Excellence, we asked Colonel Cruz Moro to share any further information about operations or any intervention. Obviously unable to reveal confidential information, he nevertheless mentioned one practical example: "Before a NATO nation deploys to a certain country, that nation asked us to prepare a report regarding a specific road where troops were going to transit. We must analyse the networks operating around... yes, it is not only about the improvised explosive device, it is always about the network," he concluded. ■

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