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Police Forces in France

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Throughout Europe the Turkish military operation against Kurdish militias in Syria has provoked a new wave of indignation against the Government in Ankara. Since Berlin, Paris, Brussels and others have long had a bias against Recep Tayyip Erdoğan, it has been possible to reach a spontaneous verdict on this new affront without any acknowledgement of the actual facts of the situation. Once again, “someone” did not want to adhere to the principles of rules-bound foreign policy and simply acted, failing beforehand to convene an international conference involving all stakeholders, that could draw on the expertise of as many non-governmental organisations as possible! Such a thing is unacceptable, such a thing is un-European, such a country does not belong in the EU, and such a NATO Member State should, if possible, even be expelled from the Alliance, according to some of the particularly agitated critics.

Regardless of how many good reasons there might be to denounce Turkey’s intervention, there are two aspects to consider. First, the so-called people’s defence militia, the YPG, against which the attack was directed, are not exactly famous in the region as angels of innocence: they are the Syrian sister organisation of the Turkey-based Kurdish PKK Workers Party, which is classified as a terrorist organisation throughout the EU. The YPG is said to have imprisoned more opposition members within the areas it controls than at the start of the Syrian conflict when these regions were under the rule of Assad, with over 5,000 having found refuge in the Kurdish autonomous region in northern Iraq.

Second, the fanatical demonisation of Erdoğan and his party overlooks the fact that previous, recent Turkish regimes have also carried out military operations against neighbouring states, or at least threatened to do so, if they felt national security required it. In a region that has been marked by crises already before the Arab Spring and the emergence of the so-called “Islamic State”, this more robust form of foreign policy is perhaps inevitable, even if it runs counter to the “sense of justice” of peace-mad Western Europeans.

Of course, in this new act of the Syrian drama, the global media and the European public have also found an opportunity to include US President Donald Trump in their outrage. Not a day goes by without Europe’s leading media, in line with its leading politicians, pointing their fingers at the incumbent in the White House from morning to night. This time the accusation was that he had shamefacedly betrayed his YPG allies with his hasty withdrawal of American forces from the Syrian border region with Turkey, and undermined his country’s claim to global leadership with the defeatist statement that the USA was 7,000 miles away from what was happening.

The unfolding of events has quickly shown that, as so often, Donald Trump has been underestimated. The USA is by no means out of the game in Syria: it is betting on a pragmatic balance of interests between the powers involved in regional events while the Europeans, if they find a voice at all, propose and demand principles that they lack the resolve to implement.

The Turkish military operation in Syria has highlighted how little is the weight Europeans can currently contribute to the balance of security and defence policy - they cannot even assert their interests on their own doorstep!

But the Europeans know very well how important the Mediterranean is for them all; countless initiatives have been taken to promote political stability and economic development with the southern and eastern neighbours. Beyond the flowery declarations, however, there have been hardly any tangible results. However, such declarations are necessary in order to bring illegal migration – a central humanitarian problem in Europe – under control. Eight years ago, for humanitarian reasons, it was deemed necessary, under a UN mandate, to intervene in Libya, resulting in an increase in the flow of refugees and chaos that has persisted to this day.

Last, but not least, the strategic incompetence of Europe’s political leadership has brought back into play, in the eastern Mediterranean, an actor who was believed to have disappeared forever from this stage, after the end of the Cold War. Russia is involved when it comes to the future of Syria – and what should give the Europeans the most to think about is that the other powers involved seem to expressly welcome it.

Peter Bosdorf

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■ Schiebel CAMCOPTER Completes SAR Trials in Norway

(jh) Schiebel successfully demonstrated the shipboard integration of its CAMCOPTER®S-100 as well as the unmanned aerial vehicle's (UAV) search and rescue (SAR) capabilities to the Norwegian Coast Guard on board KV SVALBARD in September. The flight trials included a search and rescue mission, where the Verti-

Photo: Schiebel



cal Takeoff and Landing (VTOL) Unmanned Air System (UAS) CAMCOPTER® S-100 and a manned SEA KING helicopter teamed up in a simulated "man overboard" operation. The mission was successfully accomplished. The "man overboard" dummy was found by the CAMCOPTER® S-100, which was equipped with the PT-8 OCEANWATCH wide-area maritime surveillance payload from Overwatch Imaging, the high-quality L3 Harris WESCAM MX-10 real-time Electro-Optical/Infra-Red (EO/IR) camera and the Schiebel-designed HARPOON system, which supports takeoff and landing in conditions up to sea state 5. The images were transmitted in real time to the operations room on board KV SVALBARD and a local land-based control centre via its Radiator Maritime Broadband Radio (MBR) link where it was forwarded via Internet and broadcast to the Joint Rescue Centre. Subsequently, the manned helicopter retrieved the dummy from the water. According to Schiebel, the S-100 is the only VTOL UAS routinely flying from ships, outside of the United States. In addition, it is capable of carrying a multitude of payloads.

■ Quantum-Proof Crypto from Sectra Approved by the Dutch National Security Authority

(jh) The national Dutch security authority NLNCSA has approved Sectra's latest version of the eavesdrop-proof mobile phone TIGER/S for use up to and including the Geheim (SECRET) security level. As a result of this evaluation the authority has also determined that the new TIGER/S protects against so-called quantum attacks. One of the major threats to future-proofing confidentiality is the new advanced quantum computer which is able to perform

certain types of calculations significantly faster than today's computers. Such computers pose a threat to current encryption methods and so, given the time horizon for highly sensitive information and national secrets, security solutions being developed today must offer protection against quantum threats. Sectra TIGER/S is a secure communication system developed in close cooperation with the Dutch and Swedish security authorities. It allows the user to share classified information up to and including the SECRET security level through encrypted speech, messaging or data transfer. Users include government officials, officials in the diplomatic corps, decision-makers in defence and critical infrastructure, and the military.

■ Introduction of Sikorsky's RAIDER XTM

(jh) At this year's AUSA Annual Meeting, Sikorsky, a Lockheed Martin company, introduced RAIDER X, its concept for an agile, lethal and survivable compound coaxial helicopter, specifically designed for securing vertical lift dominance against evolving peer and near-peer threats on the future battlefield. Through the US Army's Future

Photo: Sikorsky

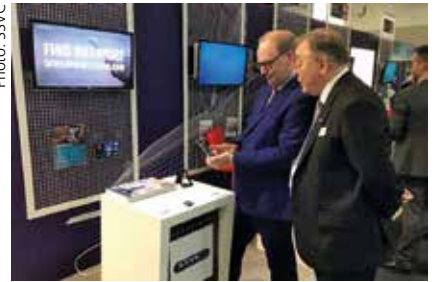


Attack Reconnaissance Aircraft (FARA) programme, RAIDER X is at the forefront of the service's approach for rapid development and delivery of game-changing technology and warfighter capabilities, equipped for demanding and contested environments. According to the company, RAIDER X draws on Lockheed Martin's broad expertise in developing innovative systems using the latest digital design and manufacturing techniques and offers exceptional performance, state of the art digital design, adaptability, sustainable maintenance and growth/mission flexibility.

■ SSVC Launches Subsea MiPlayer at Pacific 2019

(jh) SSVC Media Innovation demonstrated its new subsea version of MiPlayer at Pacific 2019. Already in use with the UK Royal Navy, Royal Fleet Auxiliary and UK Border Force, the MiPlayer platform offers access via WiFi to media streaming of recreational and training content in remote

Photo: SSVC



locations where Internet connectivity is poor or absent. The subsea platform has been specially adapted to provide an on-demand service updated via USB or external connectivity, meaning that, for the first time, users are able to access downloaded recreational media and training materials while submerged. MiPlayer is currently in use on over half of the UK Royal Navy and Royal Fleet Auxiliary surface vessels, with roll-out ongoing, as well as in operational and permanent military locations in countries such as Estonia, Poland, Bahrain, the Falkland Islands, Afghanistan, Iraq, Somalia and South Sudan. It will feature on the Royal Navy's new Type 26 Global Combat Ship, a modified version of which has also been bought by the Australian Government for the Royal Australian Navy.

■ ST Engineering Launches Industry-First Cybersecurity Operation Centre

(jh) ST Engineering's Electronics sector has launched a first-of-its-kind Cybersecurity Operation Centre As-A-Platform (SOCaaP) that delivers customised security operations centre (SOC) solutions expected to result in greater operational efficiency and significant cost savings for customers' digital assets. The SOCaaP, which provides a suite of capabilities to protect, detect, respond and recover from cyberattacks,

Photo: ST Engineering



includes technologies such as a new age Security Information and Event Management (SIEM) and Advanced Analytics Engine. These capabilities provide automated, real-time analysis of security alerts within an organisation's network with a higher degree of accuracy, compared with existing SIEM.

In Myanmar, ST Engineering entered into a collaboration with Myanmar partner Alliance Urban Transports (AUT) to provide cybersecurity services and training for Myanmar's Government, financial services and insurance sectors. ST Engineering and AUT will jointly operate an SOC in Yangon. Through SOCaap, the setup of this SOC will be shortened to less than four months, from the lead time of over 12-months usually required for such implementation. The partners will also operate a cybersecurity training centre in Yangon to help strengthen Myanmar's national cybersecurity resilience and boost its cyberthreat detection and response capabilities. The agreement was signed by Mr Lau Thiam Beng, President of Cybersecurity Systems Group, ST Engineering, and Mr U Kyaw Win, Chairman of AUT. To date, ST Engineering has delivered more than 15 SOCs for government agencies and commercial enterprises internationally, helping them maintain a secure environment whilst ensuring continuity of business operations.

■ New Combat Helmet

(ck) Ceradyne Inc., a 3M subsidiary, has designed a new ballistic helmet. The F70 helmet delivers a high level of protection at a light weight lower than the US Army Advanced Combat Helmet (ACH) specifications. This comfortable helmet has a modular design that makes it well suited for a range of missions. It includes a novel no through-hole construction for mounting the night vision goggles (NVG) shroud, retention system and rails. The elimination of through-holes increases the shell's pro-



Photo: 3M

tection area, reduces overall system weight by up to 31% (compared with the shell of an ACH helmet) and eliminates the risk of bolts becoming secondary projectiles during ballistic events. The F70 helmet provides V50 fragmentation protection against 17-grain (.22-calibre) fragment-simulating projectiles (FSP) at greater than 840 metres per second. The ballistic shell weight starts at 1.52 pounds in the high-cut version and 1.75 pounds in the mid-cut version. This line of light-weight helmets meets or exceeds the ACH ballistic fragmentation requirements for 2-grain, 4-grain, 16-grain and 64-grain RCC, and 17-grain FSP when tested in accordance with MIL-STD662F.

■ Range Extension for PUMA UAS

(ck) US-based AeroVironment Inc. has extended its PUMA UAS product line. The PUMA LE (Long Endurance) builds on the combat-proven PUMA AE (All Environment) and comes with new capabilities, increased range, and expanded payload capacity. With the integrated MANTIS i45 gimbaled EO/IR sensor and NVG-visible laser illuminator, PUMA LE provides imagery

for intelligence, surveillance and reconnaissance (ISR) during day, night and low-light operations on land and in maritime environments. The UAS weighs only 10.4 kilogrammes, and is launchable by hand or bungee. On-board batteries provide 5.5 hours of flight endurance, doubling the time on station of PUMA 3 AE, with an operational range of 60 kilometres when used with AeroVironment's Long-Range Tracking Antenna (LRTA). PUMA LE's dual-case mission pack contains everything needed to perform two complete 5.5-hour missions with a single aircraft and Ground



Photo: AeroVironment Inc.

Control System (GCS). It has a payload capacity of up to 5.5 pounds; its ruggedised secondary payload bay enables the integration of third-party payloads with a dedicated power supply providing 18-24 volts at up to 5 amps, and an Ethernet connection port for payload communications. This enables operators to incorporate specialised payloads such as electronic warfare, RF emitter geolocation, laser designation and communications relay.

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■ Armoured Vehicles for Japanese Army

(sk) The Japanese MoD intends to procure two types of 8x8 armoured vehicles for the Japan Ground Self-Defence Force – the Common Tactical Armoured Vehicle (CTAVF) and the Next Wheeled Armoured

Photo: Shimichi Kiyotani



Vehicle. Japan's recently formed Rapid Deployment Regiments (RDR) will receive the CTAVF; it is based on the Type 16 Mobile Combat Vehicle developed by Mitsubishi Heavy Industries (MHI) which is currently in use by the RDR. The CTAVF will be delivered in several variants, such as the Infantry Fighting Vehicle (ICV) and Reconnaissance Vehicle amongst others. In 2019, the Japanese military will procure samples for JPY2.3Bn. The Next Wheeled Armoured Vehicle is to replace the current Type 96 8x8 Armoured Personnel Carrier (APC). Currently being considered are MHI's MAV, Patria's AMV, and the STRYKER of GDLS. The MoD intends to request JPY1Bn for samples in FY2019. The vehicle is to be procured in an APC version as well as an armoured field ambulance (AFA) with the APC version being procured from 2023 and the AFA version from 2026.

■ Agueris Teams up with Simulation Specialist

(ck) John Cockerill tasked its subsidiary Agueris to deliver new ground terrain and turret simulation solutions to be used by John Cockerill to train its customers. Usually, in the simulation industry, a gunnery training simulator for armoured vehicles uses a physical mock up, which is large, costly and dedicated to only one system. John Cockerill wanted to update this approach by creating a versatile system that could be used on

Photo: Antycip



various turrets. Agueris worked with Antycip Simulation to help design the required bespoke simulation solutions as Antycip is recognised in the defence simulation community as an expert provider of COTS solutions. The simulators have now been designed to train the turret and vehicle crews to operate the weapons system from basic gunnery training to crew-level training and tactical training at platoon-level. Each system includes a virtual cockpit allowing the simulation of the operator's environment, coupled with a tactical simulation. An instructor operating station allows animation and supervision, exercise creation and control, after action review and student monitoring. The system is mobile and can be deployed in a classroom, in a shelter, or in specific mobile trailers. Thanks to the virtual cockpit concept, a single simulator can be used to train on various weapon systems, through software reconfiguration.

■ New Logistics 8x8 Truck

(ck) The French truck manufacturer ARQUUS, which has been supplying GBC 8KT and GBC 180, as well as TRM trucks (the workhorses

Photo: ARQUUS



of many armies for decades), has developed a new logistics 8x8 truck. The new ARQUUS truck has an electronic management system for the driveline, the ATC (Automatic Traction Control). This new system automatically switches the forward axles' motricity on and off, and manages the differential locks on all axles. As a result of this new system, the vehicle benefits from optimal mobility on various terrains while limiting tyre wear and fuel consumption, thereby reducing maintenance and support requirements. ARQUUS has two cabin versions on offer: unprotected, and protected against ballistic and mine threats according to STANAG 4569. The 8x8 can accommodate a ring-mounted weapon or a remote-controlled weapon system. The new truck can also accommodate new generation information and communication systems.

■ Gun System Automation for Royal Navy

(ck) The UK MoD has awarded a three year contract to Babcock International for the

Photo: Babcock



Gun System Automation (GSA) 9 in-service support contract for the Royal Navy. Operating jointly from Babcock's South West facilities at Devonport and Portsmouth – specialising in warship support – this contract will provide support for all aspects of GSA9 support including Electro Optical Gunfire Control System (EOGCS), the Electro Optical Sensor Platforms (EOSPs), the Quick Pointing Devices (QPD) and below decks equipment of six Control Consoles, Gun Allocation Subsystem, Gunnery Check Fire System and two Maintenance and Analysis Facilities (MAF). Through GSA9, Babcock will deliver key services to the Royal Navy's T45 destroyers and manage a portfolio of sub-contractors and suppliers.

■ Advanced TYPHOON Delivered to the Royal Air Force

(ck) BAE Systems has handed over the most advanced TYPHOON aircraft to the Royal Air Force as work continues on delivering the capabilities required to ensure TYPHOON remains the backbone of the UK's combat air power. The company's production facility in Warton, Lancashire, is now gearing up to start assembly of TYPHOON

Photo: BAE Systems



aircraft for the Qatari Emiri Air Force, with the first jet due to be delivered in 2022. The latest delivery completes the order to the RAF, which deploys the aircraft on Quick Reaction Alert and on overseas operations.

■ New Multi-Axis Gimbal System

(ck) Cobham Advanced Electronic Solutions has developed a new multi-axis gimbal system for counter-UAV and air defence operations called SPS-1000. Cobham's next-generation sensor positioning system (SPS) accurately acquires, tracks, and points a variety of sen-

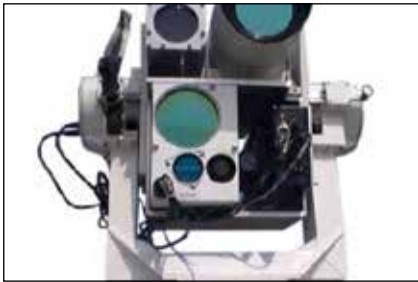


Photo: Cobham

sor payloads in harsh land, sea and airborne environments. The new positioner maximises use of Military Commercial Off-the-Shelf (MIL-COTS) components which enables cost savings and lead-time reductions. The two key benefits of the SPS-1000 modular design approach are integral field-replaceable control electronics, which eliminates all external cables without any sacrifice in performance; and a reconfigurable design allowing for utmost payload flexibility. Designed to support payloads up to 150 pounds, the new SPS-1000 features brushless direct drive DC motors; absolute optical encoders; C-based firmware as well as gyro stabilisation/slip ring and customer I/O interface options. The SPS-1000 is priced at less than US\$150,000 in small unit quantities and will be available in January 2020.

■ Patrol Vessels Delivered to Nigeria

(ck) Damen Shipyards has delivered its latest FCS 3307 patrol vessels for Homeland Integrated Offshore Services Ltd, a company founded in 2006 to provide security and logistics services to oil companies operating in Nigeria's offshore oil and gas fields. The vessels are now being prepared for their first assignments. The addition of these vessels brings improved capability to Homeland's



Photo: Damen

squadron of Damen FCS 3307 Patrol vessels. The two new arrivals have been built to the same specifications as their sister ships. Key features of the 33-metre vessels include Damen's AxeBow hull form that delivers high fuel economy and a top speed of 29 knots together with good manoeuvrability.

The power comes from three Caterpillar engines totalling 3,579 kW with each driving a fixed pitch propeller via a Reintjes WVS series gearbox. Capable of accommodating up to six crew and twelve security personnel, they can remain at sea for up to four weeks and travel 1,200NM in and around Nigeria's coastal and offshore oil fields. The security packages installed by Damen on both vessels are purely defensive; the bridges are bullet proof and armoured "citadels" within the hulls protect non-combatants. In addition to their security role, each Damen FCS 3307 Patrol has a 75 sqm cargo deck aft rated at 2.5 tonnes/m² that adds an additional level of versatility and cost effectiveness to the benefit of Homeland's clients. The decks allow them to deliver equipment and spares to offshore installations without compromising their security role.

■ IRIS-T SLS Handed over to Swedish Air Defence Regiment

(ck) In August 2019, and on behalf of the Swedish procurement agency FMV, Diehl Defence handed over IRIS-T SLS firing units to the Air Defence Regiment in Halmstad. The agile IRIS-T guided missiles are to pro-

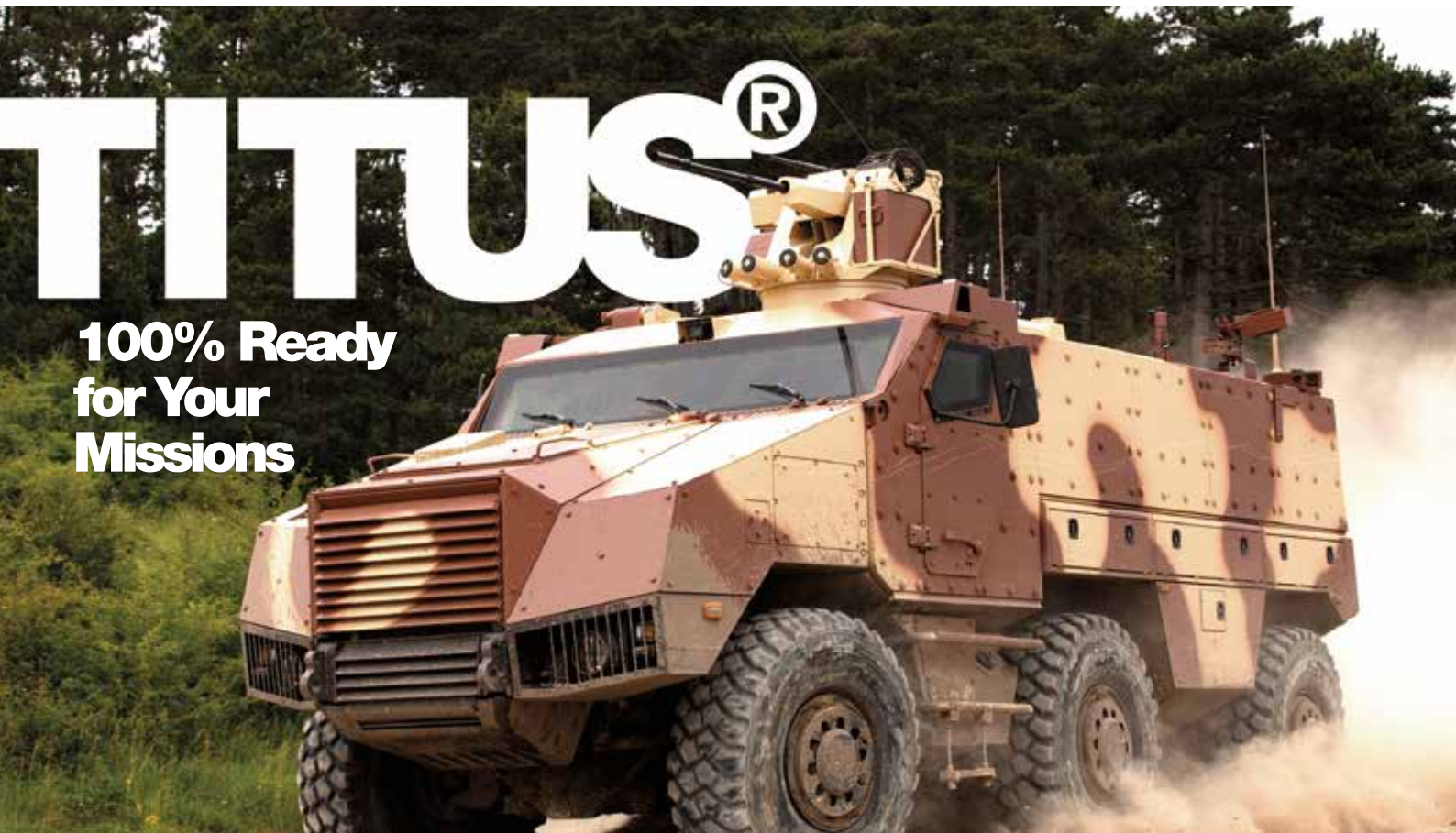




Photo: Diehl

tect soldiers and infrastructure against missiles, aircraft and attack helicopters. Sweden is the first country to benefit from the open system design of the newly developed Ground Based Air Defence (GBAD) family IRIS-T SLM/SLS, which combines and integrates system elements (sensors/radars, command and control systems, communications systems) from various manufacturers into a single weapon system. Another advantage is the multi-role capability of the IRIS-T missile, which was developed with Swedish participation and has been used for many years as air-to-air weapon on GRIPEN aircraft. In the development of the IRIS-T SLM/SLS ground based air defence systems, Diehl relied on an open system architecture to allow maximum flexibility in the procurement of new weapon systems as well as modernisation of existing systems.

Warning Devices for Hazardous Areas

(ck) E2S Warning Signals, an independent signalling manufacturer based in London, has been manufacturing a range of signalling products for industrial, marine and hazardous area environments. Providing



Photo: E2S

system designers with pre-configured solutions, the E2S product range eliminates the cost of on-site assembly operations whilst guaranteeing that connections and cabling between

devices meet the hazardous area approval requirements and ensuring all signals are fully tested and certified. Class I/II Div 1 and IECEx/ATEX Zone 1/21 approved signals are available in multiple configurations of up to seven devices, featuring products from the D1x, GNEx and STEx families with marine grade aluminium, corrosion proof GRP or 316L stainless steel enclosures. Status light type configurations of high power LED or Xenon beacons can be assembled where

each device is sealed with a line bushing, the integral cable loom providing one single point of installation either in the last beacon or optionally in a junction box. Lens colours include Amber, Blue, Clear, Green, Magenta, Red and Yellow. For complete audio visual signalling the assembly can also feature a multi-stage high output alarm horn with a flare horn or the innovative E2S omni-directional horn. In Class I/II Div 2 and IECEx/ATEX Zone 2/22 applications the D2x stacks of beacons, or beacons with alarm horn sounder, provide compact, yet effective solutions for applications requiring multiple signals. Utilising the mechanical connections, the D2x Xenon or LED beacons and alarm horn sounders can be close coupled without the need for back plates – reducing cost and weight.

Tools for the Special Operations Community

(ck) Belgium-based FN Herstal, a manufacturer of small calibre weapons and ammunition, has recently presented its newly-developed FN Ballistic Calculator, dedicated to snipers, riflemen and machine gunners. It is a compact, ruggedised high-performance weapon mounted range finder. Featuring



Photo: FN Herstal

an embedded ballistic solver and an all-in-one laser system, it enhances lethality by increasing hit probability and simplifying target designation. FN Herstal also proposes the FN FCU Fire Control Unit, which ensures first round hit probability when using a 40mm LV/MV grenade system. Ergonomic and easy to use, the FN FCU collects data, makes complex calculations, and automatically adjusts the aiming point. Fast and effective target engagement with reduced demand on the user in a high stress situation helps ensure mission success. The FN FCU Fire Control is in service with the European Special Operations Forces (SOF) community. FN also offers training solutions; its FN Expert is more than a basic marksmanship trainer, it can also be used for tactical training. There is no requirement for specific infrastructure, it can be quickly set up in any location to provide varied and realistic scenarios. It gives immediate feedback of results and is compatible with Android mobile devices.

Hirtenberger to Modernise German Mortar Ammunition

(wg) At present, training with the 120mm mortar is considerably hindered by the unreliability of the old and superseded ammunition and the resulting blockage of individual charges and types of ammunition. After a project delay of several years, Hirten-



Photo: Bundeswehr

berger Defence Europe has now received a contract to modernise the old Bundeswehr 120mm ammunition stocks. This five-year contract stipulates that the company will reprocess up to 70,000 mortar bombs by 2026. The propellant cartridge, the basic charge and the propellant charges of the currently superimposed ammunition will be replaced. According to Hirtenberger, the ammunition will be delivered ready for use. The current restrictions on ammunition would therefore be obsolete.

New Ku-band Rotary Joint for Sat-on-the-Move

(ck) Link Microtek has added the AMCORJD-2KU device to its range of microwave rotary joints; it offers a coaxial dual-channel Ku-band capability that makes it well-suited for both satellite-on-the-move and radar applications, either military or commercial. While microwave rotary joints of this type are usually designed with a high-frequency transmit channel and a lower-frequency L-band receive channel, the new device features two channels operating in the Ku band. Minimising crosstalk is therefore a critical consideration, and the rotary joint achieves a 50dB minimum isolation between the channels with typical figures being better than 70dB. The Ku-band receive channel allows designers of satellite-on-the-move stabilised antenna



Photo: Link Microtec

platforms to eliminate frequency conversion hardware from the rotating side of the assembly, making for a simpler and more compact antenna de-

sign. In addition, the device's two-channel non-contacting design means it can provide the long life with continuous rotation that is required for use in compact radar antennas. The miniaturisation was a major developmental challenge as the new device measures only 63.5 x 37.2 mm. The AM-CORJD-2KU is fabricated from lightweight aluminium with a sealing rating of IP64 to protect it from the ingress of moisture and dust. It has an operating temperature range of -40 to 55°C and is specified with a 10 year lifetime of continuous rotation.

■ Updates for SENTINEL Radar

(ck) The US Army has contracted Lockheed Martin to develop the SENTINEL A4 radar system. The contract has a value of US\$281M. SENTINEL A4 is a high-performance modification of the SENTINEL A3 (AN/MPQ-64A3; as depicted) air and missile defence radar and will provide updates to improve the existing SENTINEL capability against cruise missiles, unmanned aerial systems, rotary wing and fixed wing threats. The new SENTINEL A4 radar will provide improved surveillance, detection, and classification capabilities against current and emerging aerial threats in order



Photo: US Army

to protect Army manoeuvre formations and high value static assets to include: command and control nodes, tactical assembly areas and geo-political centres.

■ New Airborne Multi-Sensor Pod

(ck) Logos Technologies has recently unveiled its airborne, platform-flexible Multi-Modal Sensor Pod (MMSP). Mounted on planes, helicopters and unmanned aircraft systems (UAS), the MMSP houses a wide-area motion imagery (WAMI) system, a wide-area hyperspectral imager, a high-resolution spotter and an onboard embedded processor for real-time processing and storage. The three MMSP sensors work in partnership, with autonomous cross tasking, to deliver

comprehensive, multi-layered information in real-time. The pod reduces the number of intelligence, surveillance and reconnaissance sorties needed over a target area, saving time, saving platforms and saving equipment. As part of the MMSP, the WAMI system can image a city-sized area in medium resolution, enough to detect and track every mover within a vast scene, while the narrow-field high-resolution spotter can be cued to monitor over 10 locations automatically, providing identification-quality imagery. The hyperspectral imager provides additional information by scanning the scene for unique spectral signatures of camouflaging netting,



Photo: Logos Technologies

explosive stores, tank hulls or other relevant targets. The MMSP hyperspectral imager covers an area 15 times larger than that of traditional hyperspectral sensors, and it re-



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cords, tags and stores up to eight hours of imagery for review by analysts while the pod is still in the air. It does all of this while fitting in a package that weighs less than 45kg.

■ Cockpit Trainers for US Army

(ck) MetaVR has delivered image generators for the Reconfigurable Virtual Cockpit Trainers (RVCT) to US Army PEO-STRI in Orlando, an institution that acquires and sustains simulation and training solutions to optimise warfighter readiness. MetaVR's Virtual Reality Scene Generator (VRSG) is providing the image generation for the US Army's RVCT simulators. These include multiple versions of mixed-reality rotorcraft reconfigurable cockpit systems as well as six virtual reality door gunner trainers. VRSG fulfils the image generation requirements for immersive virtual reality, augmented reality, sensor, and conventional out-the-window capabilities for both the side door gunnery trainer and



Photo: MetaVR

the APACHE sensor software. The side door gunnery trainer takes advantage of VRSG's built-in support for the HTC VIVE Pro Head Mounted Display (HMD), providing high-resolution stereo rendering at 90 frames per second. VRSG also supports the SA Photonics SA-92 augmented reality HMD, and can render a cockpit mask model, which allows the trainee to see through the HMD into a physical cockpit model. Pixels not affected by the cockpit mask model are filled in with imagery from the virtual scene. Trainees are therefore training on replicas of the actual operational hardware augmented by a seamless see-through to the virtual reality scene, thereby maximising training value.

■ New Targeting System for US Marines

(ck) The US Marine Corps has contracted Northrop Grumman to build a prototype of a Next Generation Handheld Targeting System (NGHTS). These handheld systems will enable forward observers to quickly acquire and designate targets with a high level of precision. The systems developed under the second phase of the NGHTS programme are designed to replace three legacy systems, incorporating their separate target location, laser spot imaging and laser target designation

capabilities into a single, lightweight system. Northrop Grumman has delivered more than 20,000 man-portable target location and designation systems to the US Department of Defense.

■ The Second Indian SCORPENE Class Submarine

(ck) The Indian Navy has commissioned INS KHANDERI into service, as announced by Naval Group on 28 September 2019. INS KHANDERI was built by Indian shipyard Mazagon Dock Shipbuilders Limited (MDL)



Photo: Indian Navy

under technology transfer and partnership with Naval Group and follows the commissioning of INS KALVARI in December 2017, the launching of KARANJ in January 2018 and VELA in May 2019. Olivier de la Bourdonnaye, senior executive programme director at Naval Group, said "The rise in competencies that MDL completed is very inspiring. It is the first time in history that such a large-scale technology transfer has taken place for the making of one of the most complex products found in the world. The commissioning of the second SCORPENE class submarine constitutes a new milestone for this unique industrial programme."

■ New PELI Torch Light

(ck) PELI Products, a manufacturer of protective cases and portable lighting systems, has recently presented its latest tactical light, PELI 7600. Using LED technology and with a compact design, the 7600 provides high, strobe, medium and low modes, and gives users the option to choose from five different programmes. The PELI 7600 has a performance of up to



Photo: PELI

944 lumens and is only 15.7 cm long. Additional features to support professional users are a USB rechargeable lithium ion battery and a full time battery level indicator.

■ TROPHY Active Protection Systems Delivered to US Army

(ck) Leonardo and RAFAEL have delivered the first TROPHY Active Protection Systems (APS) to defend the US Army's ABRAMS main battle tanks against a variety of anti-armour threats. This delivery marks the first of several that will ultimately fit out four brigades of tanks. Under contracts awarded last year on an urgent needs basis, the companies are equipping front-line M1 ABRAMS tanks for both the US Army and Marine Corps with their first APS systems. The deliveries are the culmination of a multi-year qualification process. A joint team of government and industry professionals from both the US and Israel worked together to adapt and integrate TROPHY for both Army and Marine Corps ABRAMS variants. Developed by RAFAEL in response to the ongoing proliferation of anti-armour threats, TROPHY provides mature,



Photo: Rafael

combat-proven protection against rocket and missile threats, while at the same time locating and reporting the origin of the hostile fire for immediate response.

■ TELEFUNKEN RACOMS to Supply Night Vision Goggles to the German Armed Forces

(wg) TELEFUNKEN RACOMS has again been selected by the German MoD to supply another 2,400 sets of XACT nv33 night vision goggles (light NVG) to the German armed forces. The contract covers a period of 12 months. This re-selection follows the delivery of more than 4,100 XACT nv33 night vision goggles to the Bundeswehr as part of an earlier procurement. All XACT nv33 are produced by TELEFUNKEN RACOMS in Germany. The systems can be mounted on different helmets, used with a head mask or hand-held. According to the company, XACT nv33 is more compact and lighter than comparable systems. It significantly improves the operational efficiency of troops in poor or diffuse lighting conditions and also allows vehicles to be moved without headlights.



Photo: Telefunken RACOMS

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Frontex – Tasks and Requirements



Giulia Tilenni

The Warsaw-based agency Frontex is an EU “practitioner body” that contributes to the implementation of EU policies concerning external borders’ protection. Although its mandate was significantly expanded in 2016, the Agency’s potential remains underexploited for political reasons.

The EU Agency Frontex was set up in 2004 to assist Member States in protecting the EU’s external borders, the security and functioning of which is guaranteed by the Agency.

Although the free movement of goods, persons, services and capital within the EU has been provided for since its creation, it was not until 1985, when the Schengen area was established, that it was anchored in European law. The Convention implementing the Schengen area, signed in 1990, entered into force in 1995. The area comprises 22 EU Member States, with Bulgaria, Romania, Croatia and Cyprus also working to prepare for accession. Conversely, the United Kingdom and Ireland have decided against such a system. Norway, Iceland, Switzerland and Liechtenstein have signed the Convention, while Monaco, San Marino and Vatican City State are de facto members.

In the years that followed, the EU institutions recognised that strengthening external border controls was of utmost importance for the EU’s internal security. The External Border Practitioners Common Unit set up in early 2000 to implement borders’ control operations was replaced in 2004 by the European Agency for the Management of Operational Cooperation at the External Borders of the Member States of the European Union, better known as Frontex.

As the surveillance and management of the external borders is the responsibility of the Member States, Frontex’s role focused on monitoring the implementation of the relevant European policies and ensuring effective and uniform checks on persons at the EU’s external borders. The Agency’s main tasks are therefore to manage migration (legal and illegal) and prevent cross-border crime.

Author

Giulia Tilenni is an analyst in international affairs based in Paris, France.



Photo: Frontex

Every year, Frontex organises a photo competition. Shown is the winner of the 2019 contest, taken by Andrzej Ziobro, of a Polish Border Guard.

Frontex, which is granted juridical personality in all EU countries, is mainly funded by subsidies from the general EU budget and contributions from Member States. The budget for 2019 is €330M.

A European Border and Coast Guard Agency

In the wake of the migration crisis that severely affected the EU in 2015, Frontex’s tasks and mandate were revised to better adapt the Agency to the challenges it faces.

The crisis has shown that the Agency was unable to effectively address the increasing security challenges on the EU doorstep, mainly due to political and financial constraints. On the one hand, Frontex did not have its own staff or assets and had to rely on the scarce human and material resources of the Member States. On the other hand, Frontex was not allowed to take independent repatriation or border management measures, but had to respond to requests from national governments.

The European Border and Coast Guard was established in October 2016. It consists of member states’ authorities responsible for border management and of the Agency with the same name – still known as Frontex.

The Agency’s main tasks are:

- to contribute to effective border control at EU external borders, including the facilitation of legal border crossings and the detection of cross-border crime;
- to provide technical and operational assistance to participating countries through joint operations and rapid border interventions. This includes the support of SAR operations for persons in distress at sea, which may arise during border surveillance missions;
- to perform risk analyses concerning both internal security and the threats that may affect the EU’s external borders;
- cooperation with non-EU countries and non-Schengen associated countries, focusing on neighbouring countries and countries of origin and/or transit of illegal immigration.;

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Photo: Frontex



Frontex's Joint Operation POSEIDON SEA, which includes the Greek islands in the Aegean Sea and Crete, has the task of assisting the EU's frontline states in border surveillance.

- to carry out a vulnerability assessment concerning the capacity and readiness of participating countries;
- to organise, coordinate and conduct return operations and interventions.

Despite these tasks resembling the original list of tasks, Frontex's mandate has been considerably extended and the Agency has received additional resources to better fulfil its tasks.

In a sort of reversed trend compared to the past, the new Frontex can pledge its own assets to frontline member states in need, as it has been granted the capacity to lease or purchase its own equipment. To better support the Agency in procurement proce-

dures, the European Commission proposed to increase Frontex funding by 34.6% in 2020, to €420.6M.

To ameliorate the Agency's efficiency, EU institutions agreed on the need to provide it with more human resources. About 1,000 additional employees are expected to join the 700 people-strong staff working in Warsaw's headquarters by 2021. An additional 250 people will be recruited to manage the European Travel Information and Authorisation System (ETIAS), a fully electronic system aimed at keeping track of visa-exempt visitors entering the Schengen Area, expected to be in place by 2021.

However, the setup of a new standing corps between 2021 and 2027 is probably one of Frontex's most important achievements. The number of border coast guards and seconded national experts will increase from 5,000 people in 2021 to 10,000 in 2027. A first revision is expected by December 2023 to verify whether the staff and composition of the standing corps is consistent with Frontex requirements and objectives.

These additional recruitments will ameliorate the efficiency and efficacy of the Agency's response to crises, as they will also feed up the rapid reaction teams, currently consisting of 1,500 people – a new category of operational staff swiftly redeployable in Rapid Border Intervention missions to support migration management support teams. Up until now, the Agency has relied on the personnel and equipment provided by the Member States in accordance with the list that was agreed during the regular consultations with Frontex.

Frontex Operational Cycle and Missions

Following a request from a member state, Frontex can launch a joint operation to solve a crisis situation threatening EU external borders. These operations, involving personnel pledged by member states and coordinated by Frontex, can take place at sea, land or air borders. Regardless of the operational environment and the scope, the operational cycle always includes a planning phase (including intelligence gathering and analysis), an implementation phase and an evaluation phase.

Frontex usually performs border control by carrying out checks at border crossing points of entry to the EU (such as sea ports, road and rail points, airports) and border surveillance. Frontex's staff can carry out a broad range of missions, from passport checks to the monitoring of pollution and illegal fishing.

To date, the Agency leads five naval operations (Poseidon in Greece; Minerva, Hera and Indalo in Spain; Themis in Italy) and assists the Western Balkans in the management of land borders. In all cases, and as usually happens with Frontex missions, deployed officers support frontline countries in the management of illegal migration and in the fight against cross-border crimes. These include human smuggling and trafficking, but also the confiscation of goods subject to customs duties, weapons and drugs.

Frontex's vessels participating in operations Poseidon and Themis are all equipped to perform Search and Rescue (SAR) mis-

Photo: Frontex



The annual European Border and Coast Guard Day is the Agency's flagship event. In 2019, Frontex hosted 600 European border and coast guard representatives from more than 30 countries in Arłamów near Poland's border with Ukraine. EBCG Day presents Europe's border-guard community with an opportunity to share experiences and best practice.

sions. According to the new regulation, the Agency is obliged to provide technical and operational assistance to member or non-member states should the need of SAR operations arise during border surveillance. Once the rescue operation is completed, migrants are disembarked and handed over to national authorities for identification and registration. Frontex assists both Italian and Greek authorities in readmission operations from hotspots.

Frontex's Role in Return Procedures

Frontex also plays other important roles in migration enforcement, as it coordinates return-related activities. In addition to IT and technical support, the Agency can assist member states in organising and coordinating national, joint or collecting return operations concerning irregular migrants, overstayers and failed asylum seekers.

Rapid Border Intervention

Since 2016, Frontex can launch a rapid border intervention, always following a request from a member state. The Agency's

executive director decides on the mission within two working days from receipt of the request, which must include a description of the situation, possible aims and envisaged needs.

Once Frontex and the host member state have agreed on operational plans (within three working days of the decision), the Executive Director shall request member states (written request) to immediately deploy the required staff previously identified in the Rapid Reaction Pool and shall also notify any request for additional staff. The redeployment must take place within five working days of the approval of the operational plans and, for additional staff, within seven working days. The members of the Frontex teams perform tasks and exercise powers under instructions from and in the presence of border guards of the state requesting assistance.

The Crucial Role of Intelligence

Monitoring and risk analysis are at the core of the Agency's missions, as they represent the core of the whole operational cycle. Frontex provides strategic risk analysis to

advise high-level decision-makers on patterns and trends in irregular migration and cross-border criminal activities affecting the EU and the Schengen area. The analyses are shared with Member States and EU institutions.

The Agency's activities are all risk-analysis driven, as this approach allows resources to be optimised and the effectiveness of interventions to be maximised. Thus, analyses concerning the trends in the medium and long term are coupled with operational analysis, based on daily developments in the areas of joint operations. Specific assessments are made before, during and following Frontex operations.

The new Regulation also mandates the Agency to carry out continuous vulnerability assessments of States' border management capacities, resulting in annual baseline assessments. The monitoring concerns equipment, systems, capabilities, resources, infrastructure and personnel, but also specific assessments stimulated by the identification of the challenges ahead. Information sharing with dedicated EU and non-EU intelligence networks, as well as with relevant organisations such as Europol, is paramount for the protection of

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Photo: Frontex

The migration crisis in 2015 led to Frontex being strengthened in financial and personnel terms.

external borders and the Schengen area. It is therefore at the core of Frontex activities concerning cross-border crime, along with risk analysis. The Agency shares the intelligence gathered at the borders with relevant national authorities and European agencies. This includes information on persons suspected of involvement in criminal activities. Frontex also formulates risk mitigation measures to be implemented together with member states. As for migration, these can receive operational and technical support when needed.

Assessing Frontex's Efficiency

Terrorist attacks and the waves of irregular migration that have been afflicting the EU since the 2010s have openly demonstrated the extent of Europe's lack of coherence in protecting its external borders. Since then, the EU has taken some countermeasures, such as strengthening Frontex missions, ap-

proving a new entry/exit system for non-EU citizens, and enhancing cooperation within the EU on information exchange and interoperability of EU databases. In this new framework, Frontex is responsible for close surveillance of the external borders and cooperation with the Member States to quickly identify and address security threats to Europe.

Nevertheless, the lack of a clear common strategy, as is also the case in other EU policies, combined with the general reluctance to promote cooperation on the management of the EU's external borders, has hampered the effectiveness of EU-led activities in general and Frontex-led activities in particular.

As the Schengen area was being created, the Member States enthusiastically welcomed the abolition of internal borders and the establishment of the four fundamental freedoms that this would entail. The enlargement of the internal area of

the Member States beyond their national borders has made intra-EU exchanges of goods, persons and services faster, easier and cheaper.

However, Member States have failed to take into account the consequences for European security. No concrete measures were taken to strengthen external borders to compensate for the dismantling of internal ones. Worse still, the competences of the EU Member States at the external borders were not adapted to the new circumstances. Consequently, the area of freedom, security and justice was placed under the responsibility of the European Commission (and thus managed by the EU), while the control of the EU's external borders remained under the purview of the frontline countries.

This situation may seem logical at first glance, since the EU's external borders are also the external borders of the individual front member states. However, this concurrent jurisdiction is a major obstacle to the creation of strong and effective EU border protection.

It is a well-known and often repeated mantra: EU Member States are not prepared to transfer part of their sovereignty in the management of external borders to the EU and thus continue to relegate Frontex to a subordinate role – supporting Member States in their activities and harmonising training and requirements.

As far as material is concerned, Frontex remains heavily dependent on the equipment pledged by the Member States. The Agency received its own 16 patrol cars only in May 2019 and will use them as mobile offices for the registration of migrants. However, it is reported that no other procurement procedures have yet been completed. Meanwhile, a Leonardo FALCO EVO UAV has been participating in Frontex missions in the Mediterranean since December 2018.

As regards strategic planning, the reform has not strengthened Frontex's independence from the Member States, which are still central in decision-making. The Agency finally has executive powers, but it is still subject to approval by the Member States, which will use it to organise operations. In other words, Frontex can be prevented from using its resources and expertise in the event of a crisis if a Member State refuses to grant the necessary authorisations. In fact, rapid intervention can only be initiated if a Member State so requires.

Concerning returns, the Agency has gained new tasks, but cannot autonomously organise return operations to third countries nor deploy its management personnel in controlled centres (hotspots).



Photo: Frontex

In May 2019, the first fully-fledged Frontex joint operation outside the European Union, taking place in Albania, was launched.

Final Remarks

In its 15 years of existence, Frontex has acquired highly relevant capabilities and skills in external border management. The Agency has extensively supported EU institutions and member states in implementing EU policies on migration and cross-border crime. Frontex is at the forefront of tackling irregular migration, especially since the peak of the crisis in 2015. The Agency is involved in various maritime missions with SAR and anti-smuggling tasks. Since the new mandate came into force, it has helped to save some 65,000 lives and arrest nearly 300 suspected facilitators and more than 100 people smugglers. Frontex has pledged its migration management support teams to assist Member States in registering migrants to speed up the long and often ineffective procedures required for relocation or eventually return. Support to the Agency for return measures has increased significantly since 2015, as the number of returnees has increased from 3,500 to around 15,000 in 2017. Frontex is currently responsible for 10% of all effective returns from the EU. Moreover, the Agency has developed cutting-edge risk analysis capacities, yearly

assessing, and then monitoring, the most important threats to EU's external borders' security as well as Member States' capabilities to effectively protect borders. The analyses, disseminated to the EU institutions and member states, provide a comprehensive situational awareness of the trends to follow, which are assessed according to their likelihood. Although Member States and EU institutions have been actively collaborating to ameliorate their response to contemporary threats, external borders' management continues to remain a state-driven policy. As each state remains in charge of border protections, duplication is the norm, with a negative impact on the allocation of scarce resources, but also on citizens' rights. Indeed, the most rapid response that EU states provide in case of major crisis is the "temporary" reintroduction of border controls. For instance, France requested an authorisation following 2015 terrorist attacks, but the measure is still in place. In this context, Frontex's capabilities are somehow underexploited. The Agency has to struggle to receive resources that are consistent with its mandate and must obtain specific authorisations to launch operations.

Article 19 of the Regulation on Frontex's modernisation (2016/1624) establishes a sort of emergency procedure that might be launched if an ineffective control of external borders risks jeopardising the Schengen area. Should a state fail to manage specific and disproportionate challenges to their border due to the given reasons, the European Council may immediately act to mitigate the threat. Frontex is in charge of the rapid intervention, and the state concerned will be required to collaborate with the Agency.

Nonetheless, even though the Council would be approving an act proposed by the European Commission, the final decision would remain fully intergovernmental.

In the defence domain, strengthening European collaboration in external borders' management by creating a comprehensive common strategy could significantly enhance efficiency. Such a strategy should include the creation of a legal framework providing Frontex with more autonomy, for instance by permanently authorising some kind of missions – such as the redeployment of rapid intervention pools in the case of mass migrant influx. ■

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Viewpoint from Lisbon



Photo: Luis Fonseca



The Portuguese Elections A Victory for the Socialist Party

António Brás Monteiro

Despite the fact that we are a small country with just over ten million inhabitants, Portugal is a special place with a rich history of almost a thousand years and a unique geopolitics. We have discovered three continents for Europe. Globalisation? We started it, we travelled the world!

Because of our geopolitical position, we organise numerous important international events. For example, in September 2019, we organised a maritime exercise in support of NATO's Maritime Unmanned Systems Initiative, in which NATO allies tested unmanned vehicles and applications at sea in several challenging scenarios. NATO also decided that the new NATO Communications and Information Academy should be based in Portugal. It has already been built and is now in operation, providing specialised training in all aspects of C4ISR and Cyber.

The New Government

Last October saw a yet another victory of the Socialist Party; four years have passed since Prime Minister António Costa struck a deal with the liberal political forces and established a government, and it seems the Portuguese liked what they called "geringonça" (improvised arrangement). The Socialists (PS) won 36.3% of the vote, followed by the centre-right Social Democrats (PSD) with 27.7%. Amidst the election of António Costa for the new Government, I need to highlight the new State Secretaries, mainly Patrícia Gaspar, former National Civil Protection Authority spokesperson and 2nd National Commander of the National Emergency and Civil Protection Command of the National Emergency and Civil Protection Authority. Antero Luis, a former SIS Portuguese Internal Intelligence Service Director and a former judge, will now be the Assistant Secretary of State of Internal Administration. Jorge Seguro Sanchez, the former National Defence Inspector General, will become the number two of the MoD, which will continue to be led by João Gomes Cravinho. Eduardo Cabrita will also remain as Minister of Internal Administration. It is worth mentioning that both João Gomes Cravinho

and Eduardo Cabrita have been working on a close cooperation between National Defence and Internal Security.

Investment, not Expense

Recently, in a newspaper interview, I referred to the new take of the Portuguese political class on the security of our state, which is reflected, for example, in the access of our intelligence services to metadata or in the election of João Gomes Cravinho as Minister of Defence, who has a clear diplomatic attitude and strong knowledge of international relations and defence. This shows that the Portuguese State is committed to a new approach to the world that is younger, more dynamic and more proactive.

To illustrate what kind of investments Portugal has made in these areas, despite the criticism of this decision by some experts: last August, the Minister of Defence signed a contract worth €827M to purchase five new KC-390 aircraft, which will strengthen our air transport capacity, SAR and MEDEVAC mission capacities.

Fortunately, the Portuguese State regards intelligence, defence and security as an investment rather than a cost, and the budget for these areas is gradually increasing and human resources concerns are being taken into account. As a final example, the Defence Minister and several generals and admirals claim that 26 000 soldiers are not enough and that we should have at least 32 000. Weaknesses have been identified and are being addressed. Recently the Ministry of Defence has also launched a brand new recruitment portal. I think we are on the right track.

The importance of services such as SIS Portuguese Internal Intelligence Service, SIED Portuguese External Intelligence Service and in particular CISMIL Military Intelligence and Security Center is enormous. And overall, these experts have done an excellent job, especially in view of the shortcomings already mentioned.

A year ago, MI6 chief Alex Younger said of fourth-generation espionage: "You can learn a lot about a country's soul from its intelligence services."

And I believe that Portugal has a very good soul.



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A Complex Constellation of Power

Relations between Russia, China and Japan in the Asia-Pacific Region

Eugene Kogan

Although it appears that Russia and China are very often called strategic partners but not yet allies, neither Russia nor China are interested in transforming their relationship into a formal alliance.

Their non-committed policy suits both countries, since it gives them a choice to pursue mutually agreed and mutually exclusive policy. At the same time, Russia and Japan are quite concerned about

dispute. Russia is not ready to return the disputed territories to Japan in the near future, and Japan has no intention of forcibly reconquering the territories, while diplomacy is not making any headway de-

The Position of Russia

Russia has no territorial claims in the Asia-Pacific region; it is a status quo power in the Far East and wants to steer clear of China's numerous disputes with Asian countries over, for instance, the Spratly and Paracel Islands and historical grievances with Japan that date back to the Second World War era. Whether Russia can stay out of China's numerous disputes or at least tacitly support China is uncertain. China, on the other hand, had publicly voiced no concern about Russia's annexation of the Crimea in March 2014, when the West imposed sanctions. China rather abstained from voting at the UN Security Council and, as a result, provided Russia with tacit support. Therefore, China is expecting a similar reaction to the annexation of Taiwan, for instance, or a military conflict breaking out in the South China Sea. Whether Russia will respond in a quid pro quo manner or not remains to be seen. Therefore, it can be said that Russia is playing an ambiguous role in the region where China sees itself as the leading actor on a par with the US.

For the time being, Russia is also playing a cautious game with China. For instance, in September 2016, Russia symbolically joined China in a maritime exercise in the South China Sea, although this exercise was conducted far from the disputed area in order not to upset an equilibrium maintained by the disputed sides. It should be remembered, however, that Russia and China's navies have since 2012 conducted a series of bilateral naval exercises known as Joint Sea in the Sea of Japan, Sea of Okhotsk, Yellow Sea, East China Sea and South China Sea, in order to improve their basic level of interoperability. The naval exercises continued in the Sea of Japan in 2017, in the Yellow Sea in 2018 and in the South China Sea in 2019. These exercises help the two militaries to increase interoperability in amphibious operations, air-defence, anti-submarine warfare, and search and rescue operations.



Photo: US Navy

US Navy and Japan Maritime Self-Defense Force (JMSDF) ships under way in formation in celebration of the 50th anniversary of the Japan-US alliance. The military alliance is the cornerstone of Japan's position in the region.

China's rapid emergence as a great power. Neither wishes to see China achieve a dominant position in East Asia. However, the efforts of the two countries to prevent the emergence of a dominant China have so far been unsuccessful; Russia and Japan cannot easily do away with their differences over the unresolved Kuril Islands

spite the continued efforts of Prime Minister Shinzo Abe's government to settle the dispute. Finally, China and Japan see themselves as rivals in the Asia-Pacific region and distrust each other, even though they intend to limit tensions in relations. The stalemate between Russia and Japan and the ambivalent position between Russia and China enable China to become a major power. To this end, China is using an intelligent anti-access area denial (A2AD) strategy, which is explained below. However, it should be stressed that Japan and Russia are also pursuing a very similar strategy.

Author

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Russia's policy in relation to China follows the formula of "trust, but verify". As a result, Russia takes every precaution in its policy vis-à-vis China. In February 2018, the Russian military deployed two additional S-400 air-defence batteries to Vladivostok, homeport of the Russian Pacific Fleet, in the country's Far East, to boost their own A2AD capability. Overall, Russia currently has a total of seven S-400 air-defence batteries deployed in the Eastern Military District. The deployment of additional S-400 air-defence systems correlates with the need to protect Russia's expanding naval presence in the Asia-Pacific region. Russia is thus protecting its own interests in the Far East in order to be prepared for all possible developments in the region.

The Position of China

China has a strong interest in maintaining its security in the South China Sea against regional competitors such as Indonesia, Malaysia, the Philippines and Vietnam, as well as in Southeast Asia. There China has unresolved problems with India. China, Indonesia, Malaysia and Vietnam are buyers of Russian weapons and Russia is anxious to keep them as customers for the foreseeable future. Whether China can force Russia to stop supplying weapons to Vietnam or not remains to be seen. Surely Vietnam could one day become a test case for the strengthened Russian-Chinese relations.

It is obvious that China wants to completely dominate the Asia-Pacific region, as it regards this region as China's area of interest. To accomplish this mission, China wants to push the US out and become the undisputed political, economic and military power of the region. Thus, China is ready to implement an A2AD strategy.

China's A2AD strategy aims to cover the South China Sea, as most of the South China Sea is international water under international maritime law. China's strategy for sealing off the South China Sea is based on a combination of new weapons and new terrain, represented primarily by the deployment of anti-ship ballistic missiles and long-range cruise missiles and the construction of artificial islands with the military strips that China has built unhindered in recent years.

However, the geography remains China's Achilles heel. Beijing is very annoyed that accessing the South China Sea from Shanghai or Tianjin until it anchors at the other end of its voyage takes such a long time. In order to leave the Chinese seas or return from distant ports of call, naval ships have to cross the First Island Chain. The chain of islands is the location of the



Photo: Kremlin

Despite the rapprochement in recent years, Russia is still concerned about China's rapid rise to world power. Depicted is a meeting between Vladimir Putin and Chinese President Jinping before Russian-Chinese talks in April 2019.

US Navy and the Air Force. In addition, its inhabitants are allies or friends of the United States – that is, they are potential opponents of China. Breaking the chain of islands by conquering part of it, like Taiwan, or by trying to win American allies from Washington's embrace through diplomacy, is critical to China's strategic success. For the time being, it seems that China is not diplomatically appealing for countries which contest China's claims in the South China Sea. As far as the conquest of Taiwan by China is concerned, this is still on China's table. Finally, the Chinese A2AD strategy has met with resistance from the Japan, which has its own plans to oppose China.

The Japanese Response

According to reports circulating in December 2015 and in response to Beijing's assertiveness in the East China Sea, Japan has begun placing Type-88 anti-ship missile batteries on over 200 islands in the region, many of which form part of the First Island Chain. Developed in the 1980s, the truck-mounted Type-88 has a range of 180 km and is the domestically-built version of the US Navy's HARPOON anti-ship missile. This deployment has also been complimented by MIM-104 PATRIOT air-defence missile batteries. The Abe administration has also announced that over 10,000 Japan Self-Defence Forces (SDF) will be deployed to the islands by 2020.

In addition to the aforementioned measures, Japan looks to deploy Boeing's EA-18G electronic warfare aircraft that can re-

motely neutralise China's air-defences and command system. The aircraft would enhance Japan's A2AD strategy, which aims to keep Chinese aircraft and naval vessels from encroaching on Japan's surroundings. These measures are taken by Japan to counter China as a rising naval power. Thus far, the US has not given a green light to Japan to purchase the aircraft.

At the moment, ships of the People's Liberation Army Navy (PLAN) have to traverse the East China Sea and enter the Pacific under the knowledge that Japanese missile batteries are situated at the First Island Chain. In the event of a Sino-Japanese conflict in the East China Sea, China would not be able to enter the East China Sea without risking significant losses of ships, aircraft and personnel. Thus in effect, this move by Japan is denying Beijing the ability to operate militarily in disputed waters relatively close to the Chinese mainland. By implementing this doctrine in the East China Sea, Japan joins a growing number of Asian nations who have developed their own A2AD strategy in maritime spaces.

The Position of Japan

Most Japanese hold the US-Japan alliance to be the most important element of Japanese foreign and security policy. Japan remains the cornerstone of a US-backed regional security order and partner of the US to push back against increasing Chinese economic and military influence in Asia, the Pacific and beyond. Therefore, China is seeing Japan as a defender of Ameri-

can interests in the Asia-Pacific region that China is not exactly happy about. Despite seeing the US–Japan alliance as crucially important to Japan’s foreign and security policy, Japan’s SDF are becoming more independent. After all, US Secretary of Defence Chuck Hagel clearly stated at the Shangri-La defence summit in Singapore in May 2014 that one out of four US priorities

The situation regarding Russian and Chinese interests towards Japan is quite complex. Both countries do not want a remilitarised Japan or a Japan with nuclear weapons and long-range offensive missiles. Both Russia and China believe that the US–Japan alliance, including the Mutual Cooperation and Security Treaty signed between the United States and Japan, limits their options in Northeast

pan is not on the table, and therefore the Russian–Japanese intentions to control Chinese ambitions remain unfulfilled. This leaves the three countries with their own foreign and security policies, which distrust each other and are aware of each other’s strengths and weaknesses.

Conclusion

It should be possible for Russia to achieve a balanced foreign and security policy between China and Japan. Russia knows well how to navigate for its own benefit between countries that see each other as enemies. Despite their joint military exercises, the partnership between Russia and China has not yet been put to the test. China may therefore find that Russia is not exactly the partner China expected, while even tacit support that China hopes to receive from Russia may not materialise. At the same time, the unresolved Kuril problem shows the limits of diplomacy and illustrates the unfulfilled expectations of the Japanese Government. For Russia, the solution to the Kuril question is not as crucial as for Japan, which is why Russia is putting the issue on hold. In addition, the Russian militarisation of the Kuril Islands shows that the statements of Russian officials on Kuril solutions are untrustworthy.

Relations between Japan and China are still full of mistrust and mutual accusations dating back to the Second World War. In the event of a Sino-Japanese conflict in the East China Sea, Russia and the United States could perhaps participate. It should be emphasised, however, that participation is not self-evident. As a result, China and Japan alone are pursuing their military agenda and are aware that they are facing each other if the worst comes to the worst.

Thus the Russian–Chinese–Japanese constellation is clouded by differences in perception, historical mistrust, the way the three countries play the regional game, and political elites who have much to lose in the event of a conflict. China wants to influence the great power game in its favour, including a robust economy that can finance China’s military build-up. Russia wants to maintain the status quo without participating in China’s military adventures and responding to Japan’s overtures. And Japan wants to maintain the support of the United States as it is provoked by China and its economic clout, which Japan has enjoyed for more than two decades. It is important to stress that Japan was and is the third largest economy in the world. ■



Photo: Asia Maritime Transparency Initiative

Since 2014, Beijing has been building military structures on Subi Reef – a small reef belonging to the Spratly Islands. The group of islands is contested territory and has been subject to extensive Chinese militarisation.

was “enhancing the capabilities of our allies and partners to provide security for themselves and the [Asia-Pacific] region.” That also include increasing the defence budget to support enhanced capabilities to operate independently and that’s exactly why Japan wants to improve SDF capabilities.

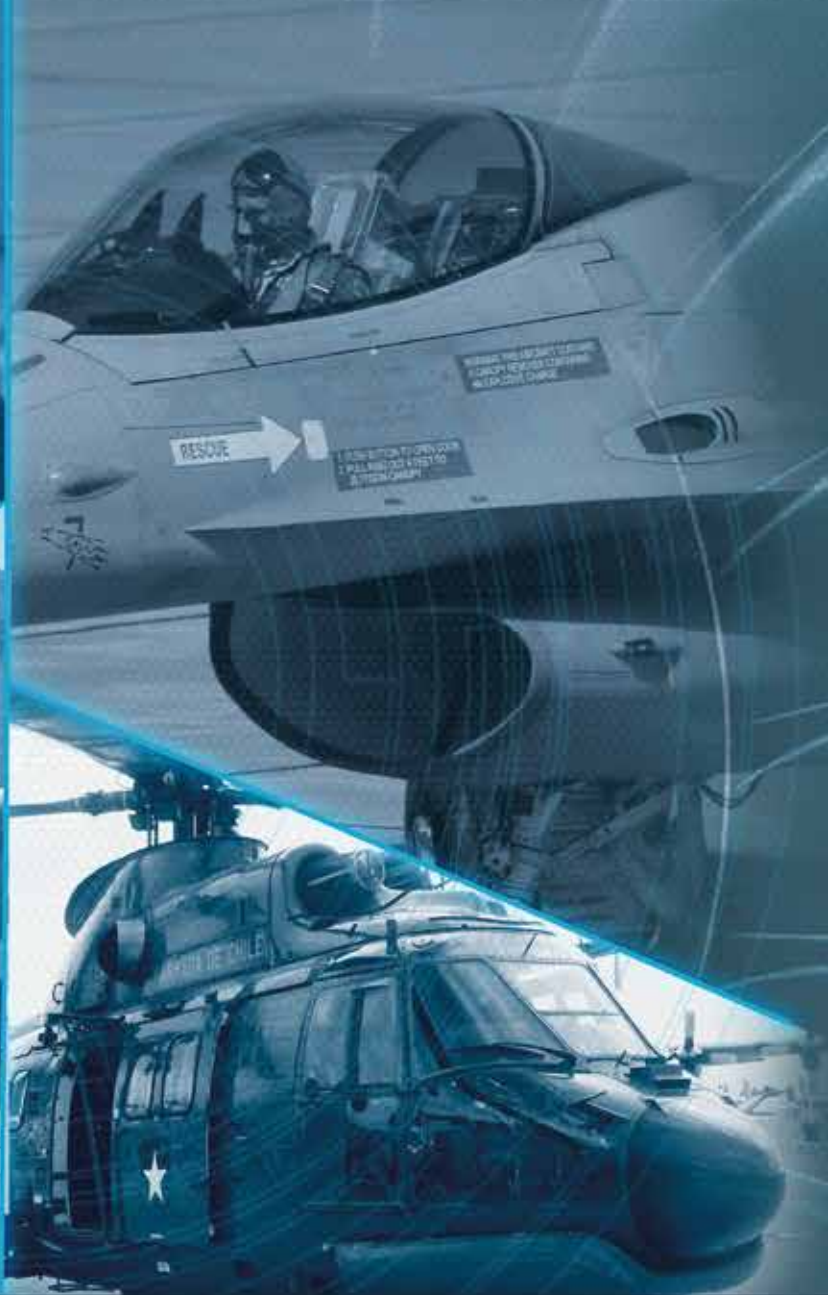
Nevertheless, Japan’s approach to solving maritime issues with Russia and China differs from that of the US. The US National Security Strategy of 2017 does not hide the fact that Russia and China are seen as opponents. Japan, however, attaches more importance to dialogue and confidence-building. Japan’s geographical location plays a decisive role in this approach, since Japan is surrounded by Russia and China and thus has no choice but to live as peacefully as possible and to be prepared for the worst. As a result, Japan is trying to solve the Kuril problem through negotiations with Russia, but Russia is not prepared to return the islands to Japan in the near future. China claims sovereignty over Japan’s uninhabited Senkaku Islands. The dispute over the islands has not yet been settled.

Asia and poses a potential threat to their security. Japan has ongoing territorial disputes with both countries that make it difficult to maintain normal relations. Japan’s smouldering territorial disputes with both countries are likely to continue for the foreseeable future.

Despite the common interest of Russia and China in Japan, Moscow and Beijing see Japan differently. Both Russia and Japan are concerned about China’s rise as a great power. Both do not want China to achieve a dominant position in East Asia. Both countries want a relationship that could control China’s ambitions, a goal blocked by the unresolved Kuril dispute. Japanese Prime Minister Shinzo Abe’s attempts to resolve the Kuril dispute showed that the Prime Minister wanted rapprochement with Russia at China’s expense. Russian relations with China have not suffered from Abe’s rapprochement. Chinese government officials recognized that Abe has little chance of resolving the dispute through diplomatic efforts, and Japan is not seeking a military solution for the Kuril Islands. Therefore, the rapprochement between Russia and Ja-

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“We are Europeans, so we trust ourselves”



Photo: Saeima

Latvia is celebrating the 100th anniversary of its armed forces. For this reason, Defence Minister Artis Pabriks visited Spain, where he opened an exhibition at the Spanish Army Museum. Spain is one of the NATO countries sending troops (350) to Latvia for the Enhanced Forward Presence Battle Group led by Canadian forces. After the wars in Georgia (2008) and Ukraine (2014), Pabriks sees the Russian challenge as an "existential threat", although "Latvia would be the first country to improve relations with the Russian government, but we cannot afford to live under an illusion".

ESD: What is the picture of the regional security in the Baltic States right now?

Pabriks: This is a regional security picture shared by our northern neighbours, namely Finland, Sweden, Norway, Denmark and Poland. When I talk about security, I want to mention climate change and the environment, but of course one of our challenges is our Russian neighbourhood, because Russia has developed and deployed its military power very close to our borders over the last fifteen years. At the same time, most European countries have reduced their investments in military and defence because they believe that peace and democracy are granted by God, the USA, or someone else. That is a dangerous feeling, because at this moment, the Baltic Sea region is in a very great asymmetry: there are much larger Russian armed forces that train very often in offensive exercises. And there are small capacities on our side.

ESD: How important is the NATO deployment for Latvia?

Pabriks: I have no hesitation in saying that Latvia is a borderland of European civilisation. Border countries always face certain challenges. In our case it is the asymmetric military power that surrounds us. We understand that every citizen of the EU or NATO should enjoy the same level of security. From this perspective, we are therefore very grateful to NATO for its efforts in our country. The NATO Enhanced Forward Presence Battle Group, led by Canadian

troops along with eight other countries, signals that we are all allies. This is a solidarity mission.

ESD: Is this deployment guaranteed for the next coming years?

Pabriks: We would like this mission to last as long as possible, as the environment around us does not seem to have changed recently. Our Russian neighbour shows no sign of understanding his previous mistakes. This essentially means that confidence between Europe and Russia has been severely damaged by the war in Georgia (2008), the invasion of Ukraine and annexation of the Crimea (2014), by falsified news and cyber-attacks, and by attempts to influence different types of elections and referenda in other European countries.

ESD: Do you believe that a Russian invasion of your country is a realistic threat?

Pabriks: No, we are not afraid of an invasion because we are strong enough and we do not expect NATO soldiers to die instead of Latvian soldiers. We are ready to fight and we are ready to die for our country. But we send the right signals to every hypothetical opponent at our borders: There will be a unified and rapid NATO response. From this perspective, the Baltic countries can be described as West Berlin during the Cold War. It is not our aim to wage war with Russia. We want a very good relationship with Russia that benefits both sides. But we want a good deterrent. So the presence of

our NATO friends shows that we are not alone. And that shows in a very visual way.

ESD: You are referring to Article 5 of the NATO Treaty.

Pabriks: Yes, but Article 5 should be perceived not only as a paper but as a reality. I think the presence of the United States, Germany, Canada, Spain and other NATO countries simply tells that Article 5 is not a joke; it is reality. But even with that NATO presence asymmetry is still there.

ESD: How often is Latvia hit by a cyber-attack?

Pabriks: At this very moment it is very likely that a cyber-attack or a fake message attack will be carried out. We've been talking about this kind of threat for 10 years. Back then, some of our friends told us: "Don't overdo it". Now it is a common reality, remember that fake news stories about German soldiers with Lithuanian girls.... Cyber-attacks can be very disturbing. One of the first cyber-attacks on the West occurred in 2007 in Estonia. Also in Latvia we were attacked by various media campaigns, which is why we have the Nato Excellence Center for Strategic Communication.

ESD: European Union, NATO or United States – which do you trust more in case of a war?

Pabriks: We don't like division between Europeans and Americans. First, we are Europeans, so we trust ourselves. Secondly,



Photo: MoD Latvia

Pabriks: Latvia spends 2% of its budget on defence, not because Trump asks for it. We really think it is important to have powerful forces. Not to increase spending would be irresponsible for Latvia, the Baltic Sea and also for Europe, because we can no longer trust our neighbour and that means we have to increase our military spending further.

ESD: Could you give us a picture of the Latvian Armed Forces?

Pabriks: We have a professional army of only 6,500 soldiers, but we plan to bring it up to 7,500. On the second level we have a National Guard system, for example patriotic volunteers who go to military exercise to train with weapons: We have 8,500 members and plan to increase it to 12,000. The third level is the reserve (former soldiers), which has 5,000 members that we can call up very quickly. In addition, we are now planning a comprehensive defence system that includes civil society, business, enterprises and military institutions. We want our society to be mentally ready for any kind of attack, just like Finland, Sweden or Switzerland. That is why we are introducing military courses in our schools.

The interview was conducted by Esteban Villarejo.

On 3 October 2019, Defence Minister Artis Pabriks unveiled a new army shooting range at Lacusils.

the Americans are our allies and after the Second World War Europe would be quite different without them, let us not forget that. There are some issues that divide our politicians, but the question is not always "trust", it is also about " capability". At this moment, the European armed forces are lagging far behind the American armed

forces. That is why we are interested in developing capabilities.

ESD: Let us talk about the 2% budgetary commitment for defence. There is no doubt that it will be one of the main topics at the next NATO summit in London from 3 to 4 December.



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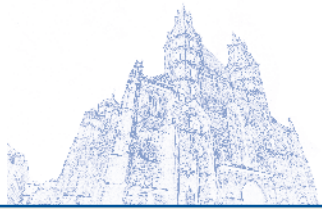


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Viewpoint from Vienna



“Unfortunately, I have to disappoint you”

Georg Mader

It was with these serious words that Maj Gen Thomas Starlinger, the current Defence Minister, addressed all Austrians. For the first time, a responsible government official openly admitted that the national army could probably not be of help to the citizens (who pay one of the highest taxes in Europe) in case of crises, disasters or catastrophes.

Several Black Holes

His statement caused considerable fuss as it came in the midst of an ongoing election campaign for the September 29 elections. The reader may recall that these elections became necessary when a corruption-ridden 2017 video surfaced via German media which subsequently toppled Austria's quite successful and popular centre-right government. The details of the scandal are still being investigated; many observers expect this to lead nowhere, either because the whistleblowers are protected by journalistic confidentiality or – as the author suspects – because a "deep state" of a supranational EU wants to prevent right-wing parties from succeeding. And it worked! The scandal has cost the right-wing Freedom Party 10%, while the shining young Mr Kurz – his party ended the coalition – has jumped to almost 40% voter approval and might well be on the road to form a coalition government with the Greens by the time this article goes into print. And it is precisely these Greens who have no idea of military affairs.

This is the background in which Minister Starlinger ignited his bomb with his video and a very pointed and sobering 132-page report. In honest texts and descriptive illustrations, the report lists the capabilities that the Austrian Armed Forces will lose if the defence budget stagnates at €2.2Bn or 0.58% of GDP. As a professional officer, he has no obligation to any party and openly said the sobering truth directly to the face as no one at his level has done before, which is why his paper "Our Army in 2030" was subsequently discussed in most of the election talks on TV and in the press. Otherwise even prominent TV presenters like Armin Wolf, recently named European

Journalist of the Year, would never have talked about "unsexy" technical issues like the successor to the obsolete Saab-105. Even more sobering, however, were the answers from the top candidates.

Chronically Underfunded for Decades

When reading Starlinger's report, it is very easy to see the holes in the defence budget. The report lists the limits of Austria's current and future military capabilities in the light of a meagre budget of ~0.6% of GNP. The report also specified funding levels necessary to reduce the "considerable investment backlog, meanwhile amounting up to €16Bn. If we maintain the current level of funding, we will soon fall below the minimum necessary to guarantee national territorial defence and the protection of critical infrastructures - in reality and in the cyber domain," he said.

Gen. Brieger said that out of 265 critical infrastructures, the Austrian Armed Forces could quickly take control and protect three of them. If an enemy would capture Vienna Airport, the nearby oil refinery and the nearby marshalling yard, Austria would need an entire brigade to retake these assets – and this is the maximum the Austrian military currently has on quick alert. When it comes to the remaining 265 facilities listed in Austria's 2014 "Programme for Critical Infrastructure Protection", we need to cite Minister Starlinger: "Sorry folks, please turn to your politicians".

First, this frightening capability gap is due to a shortage of running vehicles in the Austrian barracks, especially in the front units. These units have to borrow vehicles from other units for their exercises; most of the time they hire Hop-On, Hop-Off buses that carry them to their destinations.

The militia units, which are enshrined in the constitution as the foundation on which the federal army is to be organised, have become second-line formations in which the officers train all alone with themselves and without foot soldiers. However, this



Photo: Bundesheer / Harald Winnich

The interim Minister of Defence, Maj Gen Starlinger, has addressed the shortcomings of the Austrian military budget with bold words.

dismal situation is not only due to the dismal budgetary situation. It is also because a small group of officers are not accepting the 2013 plebiscite to maintain compulsory military service; they are still quietly working towards their goal of a professional army. Unimpressed by the discouraging experience of Sweden or Germany, they forget that a professional army would rarely be much better funded than it is now. But in a now looming coalition with the Green Party, these officers might well find allies to support their intentions.

Conscription vs. Persistent Structures

What even Defence Minister Starlinger will not be able to change – he recently said he will stay if a new government follows the conclusions of his "2030 report" – is the far too high share of 60% of the €2.2Bn for personnel costs (salaries and pensions). This share is most likely the highest among the Western armies. Material procurement is at a low 10%; internationally normal would be a share of 20 to 30%. In addition to decades of political neglect, one reason is the special status of most officers and many non-commissioned officers as civil servants for life. This status is - as with most employees in all ministries - anchored in the Federal Chancellery, so that these structures are naturally sluggish. The military leadership knows, of course, but after several reforms, the total number of defense posts of standing troops and military administration has fallen from 23,857 in 2004 to only 21,899 in 2017.

On the other hand, the current military leadership is pressing for a return to eight months of conscription, as opposed to only six months since 2006. Recruits are currently being trained, some of whom are assigned to the South/Eastern border relief mission or are deployed in other functions. Gen. Brieger described this as a "wasted human capability because we train them until they are basically usable - and then we never see them again"! However, based on statements made during the recent election campaign, it is unlikely that a new government would dare to extend the period of conscription. This also applies to the recruitment of women in the light of the frequently emphasised "gender equality".

What Needs to happen?

The most important and expensive of the urgent questions is what to do with the Austrian Air Force, as the 15 TYPHOONS require IFF/Mode-5/S upgrades and all-weather IR capability such as PIRATE or LITENING pods. The Saab-105s which still account for 35% of daily air policing will retire by the end of 2020. This issue is, however, being discussed at a very primitive level, without



Photo: Bundesheer

Austria's armed forces are chronically underfunded and face capability depletion.

any technical expertise. Chancellor Kurz has only briefly signalled his support for "the medium-term target of 1% GDP, while I call for the most cost-effective solutions in air traffic control". Days later, a Green politician called for "international cooperation on airspace surveillance" and had no idea that this would mean stationing foreign jets in neutral Austria.

It is comments like these that make the author and perhaps many Austrian pilots and technicians pause, because according to national economic figures, population data and area size, Austria could operate 40 such jets without a citizen missing a cent in his wallet. And even that would only bring Austria into the EU average.

This is the result of a lack of political will, mixed with a canine cowardice towards the media. All polls since Starlinger's report show that over 50% of Austrians demand better financing of the armed forces. This change of opinion results from the impressions gained from international events since 2014 and from the slow and painful realisation that other actors do not care at all about Austrian neutrality, the UN and OSCE location, or the Vienna Opera Ball.

The European Defence Fund

What are the political, economic and ethical aspects of one of the most important measures of the EU's new security and defence agenda?

Andreea Stoian Karadeli

In an attempt to redefine its global role and adapt to the international trend of "weaponisation", Europe has turned its focus to the security and defence sector. Although the European Union is to become a stronger and more credible player, the security and defence strategy adopted for the coming years is highly controversial and does not necessarily fit in with the nature of the European Union.

After the Second World War, the European Coal and Steel Community is formed as a first step to unite the European countries economically and politically in order to secure lasting peace and cooperation. Since then, different versions of European unity have evolved into the current European Union – an entity that is facing various internal and external challenges in today's geopolitical context. In light of events such as Russia's incursion into Ukraine, and the Arab Spring uprising and faced with an international trend toward "weaponisation", the European bloc has been reconsidering its role as a global player and has turned its focus towards the security and defence sector. The main pillars of the new security and defence strategy resulted in several acronyms to deal with: a military planning and conduct capability (MPCC) as a form of European headquarters; a coordinated annual review of defence (CARD); a European defence fund (EDF) to finance developments of prototype military kits; and permanent structured cooperation (PESCO) to allow willing EU members to cooperate more quickly in defence matters. Although it has no previous experi-



Photo: EU

Presented to the Heads of State and Government by High Representative Federica Mogherini in June 2016, the EU Global Strategy for Foreign and Security Policy (EUGS) is one of the most ambitious EU documents on defence to date.

Author

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ence in this field, the European Commission appears to be quite interested in the defence sector and eager to back it up financially in order to broaden the narrow focus from the EU's Common Security and Defence Policy (CSDP) to a complex, yet not fully understood idea of EU defence.

The New Security Context

The European shift towards the defence sector has geopolitical, economic, military and security reasons. The current defence initiatives also support the EU Global Strategy's (EUGS) goal to achieve a strategic autonomy and to develop a

European Defence Union by 2025, not only via a structured cooperation, but also with a strengthened EDITB, which is only possible with corresponding funds. This issue has been emphasised more than once by the President of the European Commission Jean-Claude Juncker. The new strategy also aims to bridge a gap between EU Member States as regards a shared vision and interest in European security. The current volatile security context, characterised by both conventional and, above all, unconventional threats, has forced nation states to understand that one European nation alone does not have the necessary capacity to meet today's challenges all by itself. Therefore, bilateral and multinational cooperation should be the cornerstones of national, European and transatlantic defence. Although national interests tend to take precedence over common interests, it is time to recognise that defence planning alone cannot lead to success at the national level. Therefore, in addition to economic and political cooperation, Member States should recognise the growing need for a common security and defence platform for the European Union.

The European Defence Fund

Adopted in 2016, the European Defence Action Plan (EDAP), together with the EUGS and the EU-NATO cooperation, is an ambitious package of measures to strengthen European defence capacities and reinforce the security and defence policy. EDAP is based on three major pillars which address interdependent needs of the development cycle in R&D: the European Defence Fund (EDF), fostering investments in defence supply chains, reinforcing the single market for defence and the promotion of civil/military synergies.

Among the measures promoted by EDAP, the European Defence Fund marks a paradigm shift for EU values and norms. Although up to present it has never been breached, the EU red-line for military activities has been challenged for 15 years by adopting a security approach to home affairs policies such as borders control. Today, funding the arms industry through diverting EU taxpayers' money from civilian areas of work becomes possible and the EDF aims to push forward the course of EU defence cooperation while it illustrates the growing role of private defence industries within EU political processes.

Photo: Ministry of Foreign Affairs Poland



After announcing her EU Global Strategy, EU High Representative Federica Mogherini travelled Europe to discuss it with member state representatives, here shown in Warsaw on 3 June 2016.

The European Defence Fund was launched by the European Commission on 7 June 2017 in the form of a set of tools to "boost Europe's defence capabilities". The EDF encompasses two main "pots" of funding and a separate financial toolbox.

The first "pot of money" is meant to fund the Research and Technology phase of military R&D. This part is already underway through a Preparatory Action, offering grants to companies and applied research groups active in the military sector. Under this Preparatory

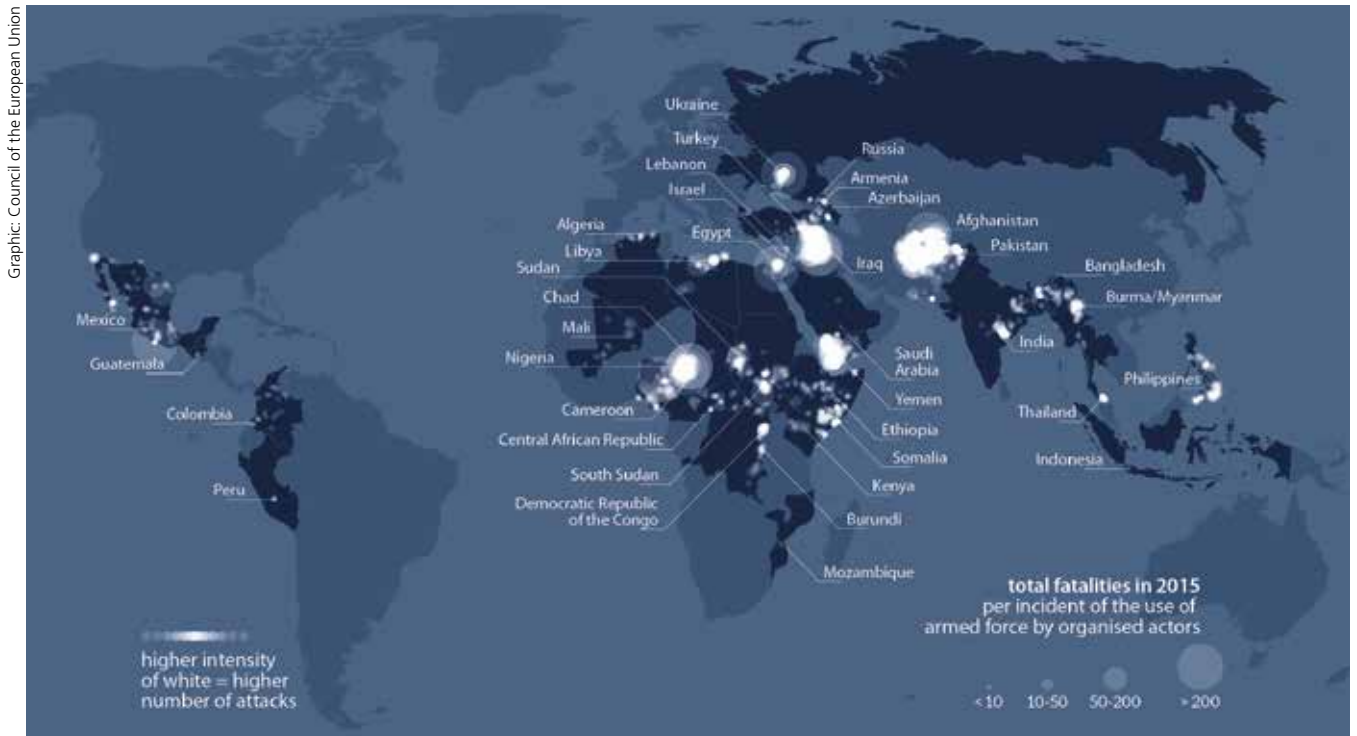
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At least 40 countries saw incidents where armed force was used by organised actors in 2015. Half of those incidents took place in Asia, and almost one quarter in the Middle East. The map shows over 5,000 such geo-referenced events. Greater saturation of white areas indicates a higher incidence of events in the same area.

Action the European Commission has made available €90M to the military industry (including applied research groups) from 2017 to 2019. For the second stage – the period between 2021-2027 -, the European Commission proposes a total budget of €4.1Bn (€585M annually on average).

The second “pot of money” is to fund the development phase of military R&D. This part is also already under way through the European Defence Industrial Development Programme (EDIDP) which will channel €500M from the EU budget to the military industry in 2019-2020. Its follow-up programme for 2021-2027 would see its budget increase to €8.9Bn over 7 years (€1.27Bn annually in average).

This industrial programme is to be complemented by voluntary contributions from the Member States, that the European Commission estimates to €2Bn for 2019-2020, and up to €35.6Bn for 2021-2027.

Thirdly, the EDF also foresees to develop a “financial toolbox” to support Member States in the joint production and acquisition of military equipment resulting from this R&D process. This third element will primarily consist of administrative and logistic tools. However, the European Commission does not exclude the possibility to even contribute financially to this production or acquisition process, in a similar path to what is happening under the Internal Security Fund.

The actions covered through the EDF are: basic research to create, underpin and im-

prove new knowledge and defence technology which can achieve significant effects in the area of defence, or increase interoperability and resilience, studies such a feasibility studies or statistics on the defence industry and projects to pilot the collection of data, technical specifications, model development and system prototype (including in an operational environment), testing, certification and qualification, increasing efficiency across the life cycle of the defence products and technologies, dissemination activities, networking events and awareness-raising activities. There is still a lot of controversy over the type of military technology to be developed as the existing regulations remain unprecise over this aspect.

Political Aspects

The EDF is definitely an unprecedented step and a far stretch from the roots of the EU which was to establish “foundations for a common economic development as a first step to a federation of Europe, to change the destinies of those regions which have long been devoted to the manufacturing of war materials, of which they themselves have been the most constant victims.” The predecessor of the European Union, the European Community, was promoting economic cooperation to prevent war. Today, the European Commission supports the EDF and promotes it as a way to safeguard the EU’s technological and industrial base, by

developing key technologies in critical areas, and to contribute to the EU’s strategic autonomy by making defence cooperation under the EU budget a reality.

The main political arguments in favour of the EDF rest on the catch-all concept of “strategic autonomy”: the EU is dependent on NATO, while the latter has made it clear that it “wants Europeans to do more for their own defence”. The EU is losing its leadership role in terms of cutting-edge technologies and equipment because it does not spend enough on military R&D and because 90% of the research is conducted at national level. Despite spending half as much as the US on defence, the EU is not half as efficient, including regarding the deployment capacities of EU armed forces, in particular because there is a high level of duplication of systems in use. The EU has 178 different types of weapon systems compared to 30 in the US. Moreover, there is a severe lack of interoperability between those weapon systems. EU citizens are expecting the EU to protect them from growing international tensions, and in particular from the worsening security situation in Europe’s neighbourhood, and there is a growing agreement that the EU’s ‘soft power’ needs some back-up hard power to be more efficient in promoting peace. All these arguments account for a paradigm shift away from the foundational values of the European Union which is why there needs to be a common understanding of what strategic autonomy actually means:

the capacity to defend itself with sufficient, appropriate and interoperable weapons systems, and a certain level of ‘technical superiority’ over potential enemies.

Since its foundation until today, the EU has never been thought of as a military alliance and it is far from becoming one. Member States find it hard to agree on many subjects, and in many situations national interests have trumped the common one. Unfortunately, in its current form, the EDF cannot resolve the structural challenges of a collective European defence just by promoting joint R&D on defence. Instead, as emphasised by the European Network Against Arms Trade, the EDF pours in more money without resolving the main two problems: duplication of weapon systems and interoperability of these systems. Moreover, the European ownership of the funding and of the R&D results, including new weaponry prototypes, is not guaranteed and it puts no restriction on the exports of the new EU-funded technologies. Knowing that in average about 2/3 of the EU arms exports are sold outside the EU, any potential “leadership gain” will be very short-term and would need a never-ending cycle of growing spending in military R&D.

There is indeed a need for a common security platform of the European Union that can provide security for its citizens based on the cooperation of all Member States, but this should not necessarily develop strictly around the defence industry. There is still a long way to go in terms of intelligence exchange, common counter-terrorism strategy development and efficient border security measures that should be tackled and taken forward.

The global trend toward “weaponisation” in recent years has pressured the EU to make this step to ensure its credibility as a global actor. There is also a heavy economic pressure that comes together with the political one.

Economic Aspects

The economic arguments brought up by the European Commission in support for the EDF are developed around the savings and contribution to jobs and growth. The lack of cooperation between Member States is estimated by the European Commission to cost annually between €25Bn and €100Bn because of lack of competition, costly duplication, lack of interoperability, technological gaps, and insufficient economies of scale. The main cause for this situation is the fact that 90% of the research and 80% of the defence procurement is run on a pure national basis. Therefore, the defence sector is presented as a key industrial sector generating a turnover of €100Bn every year and employing directly or indirectly 1.4 million highly-skilled workers

in Europe. Military research is a major driver of innovation, also leading to civil application for the benefit of all, and it is therefore important to promote the competitiveness of the defence industry, with particular attention to SMEs and export capability.

While the estimations made by the European Commission might seem tempting, they stand for a very small share of the European economy: the expected €100Bn annual turnover represents about 1.5% of the total turnover of just the EU manufacturing sector and the 1.4 million workers to be employed represent just 1% of the total EU workforce. Therefore, the economic benefits promoted by the European Commission are far less than expected, when presented at a higher scale. Apart from the political and humanitarian consequences of producing and selling weapons and military equipment, there are also economic disadvantages as it relies on public spending, protected national markets, corruption & bribery, offsets, and multiple form of arms exports subsidies. The European Network Against Arms Trade also argues against the idea that the military sector is driving innovation, stating that nowadays technology transfer from the commercial sector (like robotics, big data or artificial intelligence) to the military sector is more common and at lower cost because of economies of scale.

As it was observed at political scale, there is a general trend to increase military spending as an easy visible answer to complex challenges, and the EDF is sadly contributing to it.

Ethical Aspects

Besides the political and economic sides of the EDF, the ethical aspects are the most controversial ones. The draft European Defence Fund for 2021-2027 included a new provision for ethics reviews of the projects, allegedly to answer civil society concerns. Still, some of the main ethics concerns regarding the EDF remain: Ethical screenings will happen only before the signature of the grant contract on the basis of ethical self-assessments by the industry itself and only “where appropriate”. Activities raising ethically sensitive issues will not be discarded but conditions for their implementation shall be specified in the funding agreement. The possibility to carry out ethical checks during the implementation of a project has been removed, as well as the possibility to terminate an on-going project on ethical grounds. Experts to assist the European Commission shall be independent with various backgrounds, but in particular with expertise on ‘defence ethics’, thus favouring officials and industry experts, while the list of

experts will not be made public, making external scrutiny on possible conflicts of interest impossible.

Powerful industry-driven lobbying has also played a significant role in shaping priorities in EDF, raising important questions about the corporate capture of EU military initiatives by a nascent European Military Industrial Complex (EMIC). Civil society organisations such as Statewatch and the European Network Against Arms Trade have shown that key industry advisors to the EU are among the largest beneficiaries of the defence policies they advocate for, illustrating a troubling conflict of interests.

So far, the European Parliament and the Member States have not yet reached a final common ground on important subjects regarding EDF’s objectives, the eligibility criteria for the projects, and the overall management of the fund. While agreements have been reached on most issues, there is a lack of transparency and very little clarification regarding the procedures and logistics of the EDF. As co-legislator of the EDF, the European Parliament can provide scrutiny during the Fund’s evaluation processes, but in practice it will not have a say on which projects to fund. Additional concerns centre around the possibility that EU public funds could be used to develop technology for problematic weapons. Whereas the Fund prohibits the development of lethal autonomous weapons and weapons systems declared illegal by international law (for example, land mines and nuclear, chemical, and biological weapons), critics fear the frameworks of international law may not be sufficient to cover all the possible scenarios opened up by emerging disruptive technologies. Finally, the €13Bn for military technologies could be used more fruitfully in other areas, including on policies that address international instability before it escalates into war or conflict.

Conclusion

While admitting that there is a clear need for cooperation among Member States in terms of security and defence, the current strategy adopted by the EU does not necessarily provide for a safer and more peaceful Europe. It can lead instead to a higher weaponisation of Europe and more insecurity for its Member States. Investing in security and defence and giving the opportunity to civilians to get involved in this sector is a great step, but the money should not only flow into the development of the defence industry. Instead, the European Union should defend its soft power status and continue to invest in research and technologies that would enhance a better cooperation and communication between the security apparatus of its Member States ■

NATO Looks at More Collaboration

Alan Warnes

As the US looks to most of the other 28 NATO members to raise their defence spending, collaboration in much needed capabilities is set to increase.

By pooling resources, capital costs are not taking big chunks out of budgets, allowing the air forces to more effectively pay for the day-to-day operational costs. Of course it is not the solution to everything, but it helps, and every bit counts in an age where tax payers want their money spent

to gain price reductions, the smaller nations could lose the flexibility in the configuration or a type of aircraft.”

Most NATO nations cannot afford to buy their own sovereign assets and have opted to join collaborative programmes to achieve interoperability. “Only a few nations can af-

five Northrop Grumman RQ-4D GLOBAL HAWKS to provide NATO with a wide area surveillance solution, and the Multinational Multirole Tanker Transport (MRTT) Fleet currently made up of eight Airbus A330MRTTs with an option for three more. There are of course more in the pipeline like a E-3 AWACS successor known as the Alliance Future Surveillance and Control (AFSC) as well as an ISR unmanned aerial system, a possible maritime patrol aircraft/maritime surveillance aircraft and even pilot training. Clearly this looks like the way that NATO wants to go to cater for the needs further into the future.



Photo: Alan Warnes

NATO's AEW Force operates 14 E-3As that are expected to have their operational systems substantially upgraded in the near future. This will ensure that they remain modern and relevant until their 2035 retirement date. NATO is already studying next generation Allied Force Surveillance and Control (AFSC) to replace them. This E-3A is seen departing one of its forward operating bases, Konya in June 2019.

on other more important things like education and health. As Rudolf Maus, Director of Life Cycle Management at the NATO Support and Procurement Agency (NSPA) told ESD, “Purchasing aircraft as a collective allows smaller nations a capability that is much more affordable than purchasing a relatively small number of aircraft. If purchases then have to be combined with larger nations,

ford major capabilities and we are here to assist. Besides interoperability, we will provide integrated support solutions for NATO nations individually and collectively, as well as for the partner nations.”

NSPA is based at Capellen, Luxembourg, and was set up by NATO, in its current form, in April 2015. The organisation's responsibilities cover major multinational weapon system acquisitions for a broad set of nations. They work with individual countries or groupings of countries from NATO, EU and partner nations who collectively identify a problem.

The first collaborative programme was Airborne Early Warning and Control (AEW&C), when in 1980 NATO opted to buy 18 Boeing E-3A AWACS – the US term for AEW&C. A second, the Strategic Airlift Capability, did not appear in 2009, and led to three C-17A Boeing GLOBEMASTER IIIs being acquired. Now we have two more on the verge of becoming operational next year: the Alliance Ground Station (AGS) comprising

NATO AEW – the First

In 1980, NATO made the ground-breaking decision to acquire 18 Boeing E-3A airborne warning and control system (AWACS) aircraft. Based at Geilenkirchen, Germany, the NATO's Airborne Early Warning and Control Force (AEWCF) is the Alliance's largest collaborative venture, exemplifying multinational cooperation, with over 15 nations contributing.

Operationally, the AWACS has played an important role in NATO operations in Libya and Afghanistan, and has provided air support to secure NATO summits and other international events. Most recently, the platform has been utilised to defeat ISIL operations and Operation Sea Guardian, a security operation aimed at working with Mediterranean stakeholders to maintain maritime situational awareness and counter-terrorism capabilities at sea. There are also the ongoing assurance measures across NATO member countries. In September, one of the aircraft visited Riga International Airport for such a mission, across the three Baltic states. During a press briefing, Colonel Aivars Mezors, Chief of the Latvian Air Force said; “We truly appreciate the contribution of our strategic ally with this unique capability in strengthening Latvia's and our regional security,” adding; “The landing of NATO E-3A AWACS here is a very powerful signal of NATO's solidarity and reliability. It also shows a strong understanding from our allies about the geopolitical security situation.”

Author

Alan Warnes is a journalist specialising in military aviation and has travelled to over 60 countries researching articles and taking action photos for his work. For 12 years, he was the Editor of AirForces Monthly. He has also written several books, including two on the Pakistan Air Force (in 2008 and 2017), and most recently on 100 years of Aero Vodochody.

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There are only four other nations fielding AEW&C aircraft. France (Boeing E-3F), Greece (Embraer EMB-145H ERIEYE), Turkey (Boeing E-7T) and the UK (Boeing E-3D) provide assets if available for NATO's collective good. Greece contributed a EMB-145H to the Libyan air operation, in 2011 because it was the best at detecting helicopters. But usually, Greece and Turkey AEW&C aircraft stick to their own sovereign interest which means keeping an eye on each other. RAF E-3As have been extensively used over Afghanistan and Iraq but also put in time patrolling Poland's eastern border checking on any possible Russian aggression. They don't just control aircraft in the sky and cover air space surveillance, but can provide fighter control during operations and exercises, co-ordinate search and rescue ops, control ground-based airspace defence units and support maritime ops. Maus, a former German Air Force general who joined NSPA in 2015, explained how the NATO AEW force works with other nations' sovereign assets. "It is a contribution in kind. If NATO is conducting or planning an operation, then based on a force generation process the capabilities will come from NATO itself or contributing nations. Those countries with their own aircraft have to decide if their national owned asset can be provided to NATO and the NATO Commander. For example, the UK can provide assets to the Supreme Allied Commander Europe (SACEUR) and NATO Commander of the mission, but it has the final say. The same goes potentially for the French, Greek and Turkish systems; they are nationally owned assets but they might be offered by the nations as a contribution." Right now the NATO E-3A fleet is in desperate need of modernisation. They might be more modern than the RAF ones, but that wouldn't be difficult because the latter have never had their back end operating systems upgraded. Rather than upgrade now at a huge cost, the RAF is instead acquiring five new E-7s. It has been nearly 20 years since NATO's surviving 14 E-3As (sometimes referred to as NE-3As) have seen their operational systems upgraded. But that might all be set to change. In June, NATO's NAPMA (NAEW&C Programme Management Agency) announced that the finalisation of a US\$1Bn upgrade contract should be completed by December. However, a dispute over the funding arose, which can be a problem with collaborations, led NATO calling an extraordinary meeting in September to resolve the issue – although no announcement has been made yet. For future AEW&C ops, NATO is considering the Alliance Future Surveillance and Control (AFSC) programme to replace the E-3s. The programme is a high priority for NSPA's Ru-



Photo: Northrop Grumman

NATO will operate five RQ-4D remotely piloted aircraft acquired by a group of 15 Member States. The Alliance Ground Surveillance (AGS) aircraft is based on the US Air Force Block 40 GLOBAL HAWK.



Photo: NSPA

Rudi Maus, a former German Air Force general, is the Director of Life Cycle Management at the NATO Support and Procurement Agency (NSPA).

dolf Maus as it will be the first acquisition started from scratch by NATO. Maus went on: "Based on high level requirements from NATO we want to define options for a future surveillance and control capability after the AWACS era. In phase 1 the capability requirements have been defined and in phase 2 we are asking industry for solutions to identify options." Adding, "Potential solutions are open, it might not be a new platform like AWACS. The objective is to find a solution for future surveillance and control needs, whatever that may be."

Strategic Airlift

In 2009 a second NATO fleet, comprising three C-17A GLOBEMASTER III heavy airlifters, was formed to meet Europe's much needed Strategic Airlift Capability (SAC). Increased globalisation and NATO's need to operate outside of Europe meant strategic airlift became a priority. A lack of available strategic airlift in Afghanistan soon became apparent in 2003, when troops, vehicles and helicopter support for the International Security Assistance Force (ISAF) needed to be consistently rotated in/out of the war-

torn state. To assist in the situation, civilian transport aircraft like the Antonov An-124 were chartered or leased. However, it didn't hide the need to completely overhaul the strategic airlift situation, when countries like the US were doing a lot more than many other NATO countries in the re-supply effort. On 23 September 2008, 12 nations signed a memorandum of understanding to establish a strategic airlift capability. A week later on 1 October 2008, NATO ordered two C-17A GLOBEMASTER IIIs under a foreign military sales (FMS) agreement, while a third came as a non-cash contribution by the US. More importantly, 10 NATO nations and two partner nations agreed to share the cost and take up an appropriate percentage of the flying hours (see table). The first aircraft arrived at Papa Air Base in Hungary where they are based on 14 July 2009, and the Heavy Airlift wing was established on 27 July, leading to the first operational airlift mission on 13 August, when passengers were flown from Ramstein to Pristine, Kosovo. The first ISAF mission took place on 27-28 September 2009. While the HAW, which celebrated its tenth anniversary in July manages the capability, the NATO Airlift Management Programme (NAMP), an integral part of the NSPA, ex-

European Strategic Airlift Share		
USA	32%	1,013
Sweden	17.4%	550
Netherlands	15.8%	500
Norway	12.5%	396
Romania	6%	190
Poland	4.7%	149
Finland	3.2%	100
Bulgaria	2.1%	66
Slovenia	1.9%	60
Hungary	1.6%	51
Lithuania	1.4%	45
Estonia	1.4%	45
		3165



NATO's Heavy Airlift Wing based in Papa, Hungary, provides 12 nations with 3,165 hours of flying time.

ecutes the HAW's acquisition and sustainment needs. The 30-year programme provides 3,165 declared flight hours per year, with 335 hours in reserve for contingency purposes. The US has committed to using the most hours (1013) and Sweden comes second (550), then Netherlands (500) and Norway (396). Smaller nations such as Lithuania and Estonia have committed to purchase 45 annual flight hours each.

Multinational Multi Role Tanker Transport Fleet (MMF)

The MMF was launched in 2016 and today eight A330 MRTTs have been procured for strategic airlift, air to air refuelling and medical evacuation (MEDEVAC). They will be operated by a multinational MRTT unit comprising Belgium, Germany, Luxembourg, Netherlands and Norway, but there is scope for more partners and the contract allows for three more aircraft. Five A330 MRTTs are to be based at Eindhoven, Netherlands and three at Cologne, Germany. Asked why the aircraft were being split between two bases, Maus responded: "They are both operational and can operate the aircraft. The decision to go for two was to provide operational flexibility. If one base is not operational we can move into the other."

On the hours, Maus commented: "Germany is the largest contributor with a need for 5,500 hours which makes up five aircraft." He continued: "From an opera-

tional perspective we negotiated for eight, but from a contractual perspective we negotiated further options for up to 11. We are starting to see the latter materialise, with another nation [he wouldn't name] buying into a ninth aircraft with a need for up to 1,000 hours. Other nations are interested, too, which would cover the tenth." Eastern European countries have been slow to take up the air-to-air refuelling option, but the Czech Air Force with its GRIPEN fleet is expected to sign up for 100 hours in late October.

Alliance Ground Surveillance (AGS)

The first of five Northrop Grumman RQ-4D GLOBAL HAWKs UAS acquired as part of the AGS was set to be delivered to Sigonella Air Base, Italy in October. A May 2012 contract estimated to be worth around US\$1.4Bn has seen the systems, along with Airbus command and control centres, delivered 52 months later.

After the enhanced GLOBAL HAWK made its first flight from Northrop Grumman's Palmdale site in California on December 15, 2019 there have been some serious technical issues which has meant it will be delivered two years late.

The RQ-4D is NATO's equivalent to the USAF's Block 40 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. The system will continuously detect and track targets throughout the areas of interest. An extensive suite of line-of-sight and beyond-line-of-sight, long-range and wideband data links will ensure the information is data-linked to the ground real time. In addition, the UK and France are planning to contribute with a similar national capability to complement the GLOBAL HAWKs. Sigonella will serve as a NATO Joint Intelligence, Surveillance & Reconnaissance (JISR) deployment base and data exploitation centre.

AGS will observe what happens on the earth's surface in the same way the AWACS monitors airspace. The programme has been financed by 15 allies: Bulgaria, Czech Republic, Denmark, Estonia, Germany, Italy, Latvia, Lithuania, Luxembourg, Norway, Poland, Romania, Slovakia, Slovenia and the United States. However once delivered and handed over to NATO in October, it will take a year to be fully operational. The AGS will be operated and maintained by NATO on behalf of all 29 NATO members.

Performing persistent surveillance over wide areas with the GLOBAL HAWK, in all weather conditions at considerable stand-off distances will be a considerable boost to NATO's global as well as European capabilities.

Other Solutions

Some industry players, like Leonardo, are offering jet training within its academy at Lecce, which it finances and operates. Maus thinks it sounds attractive, "This is not a NATO requirement now, but it has potential for the future." Another capability being considered by nations is a maritime surveillance/maritime patrol aircraft where NSPA could interface with the wider industry portfolio. Maus adds, "It is in its early stages but more than a handful of nations are interested in seeing what's possible in the future. We will enable it but the requirement by the nations has to drive it." Then he talks of another collaborative option: "Right now Belgium, Luxembourg, Poland, Spain and others are looking at an intelligence surveillance and reconnaissance UAS. We see a clear trend in all their needs for already ongoing and potential future operations and we can ensure the nation's future multinational co-operation. They may want to be interoperable with the same system in a potential theatre and we can support to make that happen." He finishes: "Defence spending can go further for the common good and so we really need to ensure nations know what NSPA can do for them." ■

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“We must remain ready to share responsibility with our allies.”



Photos: Guy Toremans

In the last 25 years, the Royal Danish Navy (RDN) has changed dramatically. At the beginning of the new millennium the RDN underwent a transformation from a large 'small ship' force to a modern blue-water navy with five high-end frigates / combat support ships. ESD had the opportunity to talk to Rear Admiral Torben Mikkelsen, Chief of Naval Staff, Royal Danish Navy.

The three IVER HUITFELD class frigates are the most powerful ships that the Danish Navy has ever had and provide the sea service with a global reach. The two ABSALON class units, designated as support vessels, are essentially flexible frigates, capable of performing a wide variety of tasks and missions. The four THETIS class patrol frigates, commissioned in 1991-1992, and three KNUD RASMUSSEN class, which joined the fleet between 2008 and 2016, were built principally for operations in the North Atlantic and around Greenland and the Faroe Islands. Other units in the RDN's inventory include the six DIANA class patrol vessels, commissioned between 2007 and 2009, and designed to perform a broad range of constabulary and support tasks; some 36 coastal patrol craft, about 23 auxiliaries and one royal yacht – the HDMS DANNEBROG. With the navy's transition to many more international engagements, the Naval Home Guard has taken over some of the navy's day-to-day maritime surveillance, rescue and environmental monitoring tasks in Danish home waters.

ESD: Admiral Mikkelsen, how would you describe the responsibilities of the Royal Danish Navy?

RADM Mikkelsen: Our overall mission is to protect Danish interests from the sea, enforcing control and support in Denmark's territorial and EEZ waters, including Greenland and the Faroes, for example

monitoring all maritime traffic in and out of the Baltic, carrying out fishery inspections and search and rescue (SAR), executing any missions required by our Government and, in addition to our NATO commitments, we regularly deploy assets in support of international UN- or NATO- led security or peacekeeping operations. The frigates and the combat support ships are focused on international missions and are heavily engaged in deployments with NATO's Standing Maritime Group 1 (SNMG1), counter-piracy operations off the Horn of Africa and in the removal of chemical agents from Syria, where we took a leading role.

To name but a few of our major deployments: HDMS IVER HUITFELDT participated in anti-piracy operations off Africa whilst in 2014 HDMS PETER WILLEMOES was part of the OPRECSYR tasked with disposing of Syrian chemical weapons. In 2017, the HDMS PETER WILLEMOES deployed with the USS GEORGE H.W. BUSH carrier strike group. In 2018, HDMS NIELS JUEL was the flagship of NATO's SNMG1 for six months and earlier this year she deployed with the French carrier FS CHARLES DE GAULLE in Mission CLEMENCEAU. Our versatile ABSALON class units have undertaken several deployments as part of multinational missions, such as flagship to the CTF-150 in the Gulf and as flagship of NATO's SNMG1. The lower-end patrol frigates/OPVs are focused on operations in the Arctic.

And on top of that comes the emerging geopolitical importance of the Arctic due to climate change.

ESD: Obviously the operational speed of the Royal Danish Navy has increased in recent years. Can you still meet all your national and international obligations? How do you optimise your available resources?

RADM Mikkelsen: In fact, our commitments have increased significantly. Due to our growing tasks and missions, with increasingly frequent long-term expedition missions, the protection of Danish and allied interests in the Baltic Sea and the changing security situation, we are reaching our limit.

Although we are still in a position to fulfil all the tasks set by the Danish Government, tough decisions and targeted prioritisation are the order of the day. I must be selective in drawing up the programmes for ships.

ESD: In recent years, security concerns on NATO's northern flank have increased as a result of intensified Russian naval operations. Denmark cannot escape the importance of its geographical position in Europe as a "gatekeeper to the Baltic Sea". How do you see the "threat" from Russia and what impact does this have on your navy?

RADM Mikkelsen: Given the resurgent Russian Navy's activities and its intent for a permanent submarine presence, there is a renewed focus on the trans-Atlantic link and on anti-submarine warfare (ASW), while the Baltic is again a significant military hotspot. We all know about the importance of the trans-Atlantic link. It is imperative for Europe to ensure unimpeded use of these waters that are so crucial for alliance cohesion in the region. Ships transiting to and from the Baltic must pass through the Danish Great Belt or the Sound between Denmark and Sweden. Hence the importance of cooperation with our Baltic partners because they are heavily depending on the Baltic sea lines of communication (SLOCs). In response to the perceived Russian aggression our main concern focuses on potential threats to these SLOCs and to build up capabilities.



The two ABSALON class units have received the SitaWare C2 software suite from Systematic and a Rheinmetall Oerlikon MILLENNIUM gun.



For six months the HDMS NIELS JUEL was the flagship of NATO's SNMG1.

Therefore, it is imperative to have ships that are capable of assisting in monitoring and keeping these lines of communication open.

ESD: You said that the Arctic is becoming more and more important. Major changes are taking place and the consequences of climate change are already beginning to show. Should the Danish Navy increase its military presence in the Arctic?

RADM Mikkelsen: Denmark is centrally located in the Arctic and has a long Arctic tradition, particularly in Greenland and the Faroe Islands. The Joint Arctic Command is responsible for 40,000 square kilometres.

In fact, we are very concerned about climate change. The consequences of climate change are already emerging. In particular, the melting of ice and the receding ice caps are making it easier to access – using the surrounding seas as transport links – and to exploit natural resources. There is also an increase in military activity in the region. It is therefore important for Denmark to continue its presence.

The government is focusing on Arctic issues in order to ensure that this fragile environment is safeguarded and preserved. This will necessitate an increase in our operational efforts in the Arctic and strengthening of our surveillance and command, control and communication (C³) systems. Our THETIS class units are used extensively in Joint Arctic Command's area of responsibility and we regularly sent one of the frigates or logistic support ships during the Arctic Summer. HMDS Peter WILLEMOES and HDMS ABSALON deployed in the Summer of this year.

ESD: I suppose that the complex security context has an impact on your navy in general and your procurement needs in particular. Can you give us a rundown on the planned procurement and upgrade programmes?

RADM Mikkelsen: Under the 2018-2023 Defence Agreement Plan we are set to receive funding for improvements in anti-submarine warfare (ASW) capabilities and the establishment of a frigate-based area

air defence and ballistic missile defence (BMD). This Defence Agreement is aimed at further developing our ability and capacity to conduct international operations and is also in accordance with NATO's policy.

Our IVER HUITFELDT frigates will receive the Raytheon SM-2 missiles together with the associated RIM-066M-03BK IIIA vertical launching system featuring the Mk13 Mod.0 canisters; upgrades to their Terma C-FLEX combat management system; the installation of a Thales Continuous Wave Illuminator (CWI) for the Evolved SEA SPARROW Missiles (ESSM) and a towed array sonar suite.

At a later stage the frigates are to be fitted with a strike capacity – the longer-range Raytheon SM-6 surface-to-air missile. This subsequent acquisition may occur in the 2023-2026 timeframe.

The Government re-confirmed its contribution to NATO's defence against ballistic missiles.

An Integrated Air and Missile Defence (IAMD) study for the integration of a BMD capability with radar and sensor options for a potential BMD upgrade on board at least one of the IVER HUITFELDT class frigates, is underway. However, it is not decided yet what it is going to be, either a maritime platform, or a land-based contribution, or a combination of both.

Our nine Sikorsky MH-60R SEAHAWK helicopters are to be fitted with the AN/AQS-22 Airborne Low Frequency Dipping Sonar and Mk54 lightweight torpedo for ASW operations.

The two ABSALON class units also received a the SitaWare C2 software suite and a Rheinmetall Oerlikon MILLENNIUM gun, and will be fitted with a Thales Continuous Wave Illumination transmitter. The CWI sets are to be delivered between 2019-2021, while the SM-2 missiles and associated equipment is expected in the 2022-2023 timeframe.

And the first two units of the KNUD RASMUSSEN class – [HDMS KNUD RASMUSSEN and HDMS EJNAR MIKKELSEN] – are being upgraded with a multi beam sonar, a SAAB CEROS 200 fire control radar and the SitaWare C2 software suite. These are very capable platforms, designed for constabulary operations in the North Atlantic and around Greenland.

ESD: Are you looking into the replacements for the THETIS class units?

RADM Mikkelsen: Our four THETIS class patrol frigates are in their final third of their in-service life expectancy. In 2017, they completed the Mid-Life Update (MLU) that included upgrades to the Terma C-FLEX combat management system



The HDMS THETIS is used extensively in Arctic deployments.

(CMS); replacement of the Plessey AWS 6 with the Terma SCANTER 4103 air/surface search radar and the Celsius Tech 9LV Mk 3 by the Saab CEROS 200 fire control radar and electro-optical director; updates to communication systems, including the SitaWare C2 software suite and the installation of new hangar facilities for one Sikorsky MH-60R helicopter. This MLU allows us to keep these units in service for another 10 to 15 years. The procurement process to replace our THETIS class is underway, with a construction contract anticipated for 2024 and the new units scheduled to join the fleet from 2027 onwards.

ESD: With the decommissioning of the FLYVEFISKEN class units, the Royal Danish Navy lost its dedicated mine countermeasures (MCM) platforms and prompted the introduction of a new concept – the MCM DENMARK (MCM DNK).

RADM Mikkelsen: We are one of the first navies to end the use of dedicated minecountermeasure vessels (MCMVs) in favour of a modular-based minecountermeasure concept – the MCM DNK, introduced in 2010.

Thanks to its modularity, MCM DNK has proven to be a very flexible and reliable system. Although the drones, sonars and mine disposal system (the DAMDIC) have been some 20 years in service, they still are well suited for our tasks. The MCM command, control and communications (C³) module has been updated and we procured new side scan sonars for the SAAB SEA EYE DOUBLE EAGLE Mk2 S ROVs. But now we are starting to look into the replacement of the drones, the two HOLM class multi-role craft (MSD) and the four Minor Standard Vessels (MSF).

ESD: Another new challenge is cyber vulnerability. What are the main cyber threats to the Danish Navy?



Denmark is considering the replacement of its HOLM class multi-role craft (MSD) and its Minor Standard Vessels (MSF).

RADM Mikkelsen: The Government takes the cyber threat very seriously and launched a comprehensive effort to strengthen Denmark's cyber defence with the creation of a national Cyber Situation Centre and to expand the capabilities of the Danish Defence Intelligence Service.

ESD: Today Maritime Situational Awareness (MSA) and Maritime Security (MS) are the higher priority. What do you think is needed for an effective approach? Do you see prospects for wider co-operation?

RADM Mikkelsen: With the maritime challenges being more diverse, complex and unpredictable, maritime security is paramount and has become one of the navies' core tasks. But these security challenges cannot not be mastered by any navy alone. Cooperation is imperative. We are involved in the development of international cross-sectoral networks for information exchange and are enhancing the collaboration with our international partners in order to bundle our competences in the different warfare areas. With the Scandinavian and Nordic countries continuing to play important roles, particularly with regard to the High North, we are deepening our defence ties.

ESD: Many navies in the world are facing personnel retention problems. What challenges does your navy face in recruiting the right people?

RADM Mikkelsen: It's a challenging recruiting environment. As people in the civilian world find better paid jobs, we try to convince them that the Navy is fascinating and offers attractive career opportunities. And since young people today are more likely to consider job hopping, we want to make it easier to switch between naval and civilian professions and vice versa. But obviously this requires a rethink.

ESD: What is the way ahead for the Danish Navy?

RADM Mikkelsen: In view of the forthcoming comprehensive modernisation programmes, I am quite optimistic about the future.

My main concern, however, is to further increase the Navy's flexibility and fighting power to better respond to emerging security situations and to maintain our responsibility as a NATO member. We must remain ready to share responsibility with our allies.

This interview was conducted by Guy Toremans.

NATO Air-to-Air Refuelling

Alan Warnes

Air-to-air refuelling (AAR) is a major force multiplier, enabling range, payload and combat radius extension of receiving aircraft.

The two main refuelling systems are “probe and drogue” and the boom. During the Cold War, AAR was limited to support long-range strategic forces, which is one of the main reasons why both France and the UK has operated tankers for so many years. Most of the other NATO mem-

beyond the North Atlantic’s geographical domain. The lessons learnt from Operation Allied Force, when NATO attacked Yugoslavia from bases usually in Italy was that there simply weren’t enough AAR assets. A 2011 Joint Air Power Competence Paper said: “Current NATO policy holds individual

days even some of the bigger nations find it difficult to maintain their own AAR capability, so if the likes of France, Germany, Italy, The Netherlands, Spain, Sweden and the UK which have their own air to air refuelling assets find it difficult, what hope is there for the smaller nations?

The air forces of Hungary and Czech Republic both field a small fleet of GRIPENs and their pilots suffer because they do not get the AAR currency needed. There are no pilots current in AAR within the Hungarian Air Force, while the Czechs have two. The latter got some AAR training in, with a Swedish Air Force C-130H when four GRIPENs were deployed to Sweden for a live firing exercise in April.

The Czech Air Force GRIPENs did get some AAR currency in May 2018 during Exercise Sky Avenger when a pair of USAF/Nebraska ANG KC-135Rs deployed to Pardubice, Czech Republic. But that has now expired. They were supposed to get some time with a deployed KC-135R in April but that fell through and the sole Swedish C-130H tanker was due to visit Caslav in May but that went the same way.

Lt Col Pavel ‘Speedy’ Pavlik, the Operations Officer at Caslav told the author in July: “Tanker training has been difficult to execute although we have a couple of pilots who are current.” ‘Speedy’ also led the Czech Air force GRIPEN detachment to Estonia, for Baltic Air Patrol: “There will be some NATO tankers available there which we hope to operate with, but we are struggling because AAR is a ‘high demand, low availability’ issue.”

He went on, “We know about the assets and the orbits [for BAP], and when they fly but it is down to national priorities. Often the Germans, Italians and UK have their own priorities for their tankers, but if spare slots become available we try to get one. But it is tough trying to get all the squadron members current in AAR.

MMF

Well now there is a solution for countries like Hungary and Czech Republic which means they will not have to buy their own tankers. Instead they can buy flying hours from a NATO/EU fleet of A330 MRTTs.

In 2016, NATO & EU leaders signed a Joint Declaration document that mandated greater inter-organisational cooperation.



Photo: Alan Warnes

All NATO pilots should be current in air-to-air refuelling (AAR), so it is not surprising that the major air forces like the RAF, which has over 100 TYPHOONS, have a significant tanker fleet. Here a pilot practises his AAR skills with a VOYAGER air tanker.

bers assumed that their respective air forces would operate much closer to home. After the end of the Cold War there has been a need to train for expeditionary operations,

nations responsible for the training, maintenance and deployment of their forces to and from an area of operations. AAR is critical to both the success of the deployment and any concurrent operations; to deploy the forces in a timely manner, in minimising both the logistic footprint and the chances of ground aborts during transits, and in maintaining a high tempo of operations. With the challenges associated with EO, AAR’s role as a Force Multiplier has become increasingly important.”

Smaller Nations Issues

All of NATO’s fighter pilots are expected to be qualified in air-to-air refuelling (AAR), but not every country has a defence budget big that can afford tanker aircraft. Now-

Author

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Photo: Alan Warnes



The RNLAf currently operates two KDC-10s which work with the EATC. The first aircraft will be retired by the end of 2019 and the second by the end of 2021. The RNLAf is one of the partners in the Multinational Multirole Tanker Transport Fleet (MMF).

Photo: MMF



The first A330 MRTT, M-001, is currently being used to train the first three sets of MMF crews and will be delivered to Eindhoven Air Base, The Netherlands, in May 2020.

Under strategic guidance it is developing 'coherent, complementary & interoperable defence capabilities' which included AAR. Improvements were set to be made in three areas: the procurement of new assets via the Multinational Multi-Role Tanker Transport Fleet (MMF); optimising existing capabilities, including purchasing more A400M air refuelling kits; increasing capability by developing procedures for AAR clearances.

This should revolutionise NATO's Air to Air Refuelling (AAR) system. MMF is a co-operative programme, involving three multinational agencies: NSPA (NATO Support and Procurement Agency), OCCAR-EA (Organisation for Joint Armament Cooperation – Executive Administration) and EDA (European Defence Agency). It is currently made up of five nations – Germany, Netherlands, Belgium, Luxembourg, and Norway, with the Czech Republic expected to join in late October. Lt Col Pavel Pavlik finished, "We hope to be part of a programme that will

provide us a certain amount of hours per year, and as it's multi role we can use it as a transport, too."

The MMF has signed a multi-billion Euro deal for eight A330/KC-30M Multirole Tanker Transports (MRTTs) with options on another three. The Netherlands and Luxembourg became the launch customers in July 2016 when they signed for two aircraft. They should have been joined by Poland, but the Warsaw government pulled out a day or so before the contract was set to be signed. Poland prefers, seemingly, to work with USAF KC-135Rs through the Foreign Military Sales (FMS) channel. In September 2017, Germany and Norway signed up, which led to five more aircraft ordered and last year, Belgium joined which increased the order to eight.

NSPA are now hoping to sell more flying time and take on the options, as NSPA's Director of Life Cycle Management, Rudolf Maus explained, "Another nation [he wouldn't name] is buying into a ninth air-

craft with a need for up to 1,000 hours. There are other nations interested too which could cover the tenth."

On 2 May 2020, the first A330 MRTT is set to be delivered to Eindhoven Air Base, Netherlands, with another four set to be delivered there over the next three years. Cologne, Germany acting as a forward operating base will house the other three MRTTs with the first arriving in October 2020. Maus continued: "Having two bases provides operational flexibility. If one base is not operational we can move into the other."

Jan Der Kinderen, NATO NSPA's System Manager MMF, told me how the decision to acquire the A330MRTT unfolded. "We looked at the market in 2015 and there was only one real multirole aircraft, and while it is true there was also the Boeing KC-46 it was not operational, and still isn't. We wanted an aircraft that is truly multirole – air transport, medevac and air to air refuelling."

Der Kinderen, who assumed his role on 1 February 2019, after vacating his role as Chairman of the MMF Support Partnership, continued, "It was the tanker of our choice and a little different from the VOYAGER configuration employed by the RAF. The UK has triple hose and drogues, which includes the central station – but many of the participating nations have aircraft that required boom receivers, so we needed a boom."

Germany operates Panavia TORNADOs and EUROFIGHTERs that require a hose and drogue, but Netherlands, Belgium and Norway fly Lockheed Martin F-16s which call for a boom. All three will be fielding the Lockheed Martin F-35, which can also require a boom, thus extending the requirement for a boom system for years to come. The Czech Republic will also require a hose and drogue for its Saab JAS 39C/D GRIPENs.

Germany has signed up for 5,500 hours and with each aircraft allocated 1,100 hours per year, five aircraft were added to the fleet. Der Kinderen commented, "These are not sovereign assets. The nations don't own them, but they have 'assured access' to the flying hours and the partner nations are the only ones that can use them. Most Air Chiefs would like their own assets, but from an efficiency point of view you need the mission, but you don't need to own the assets. Some Air Chiefs might struggle with that."

Netherlands will take up 2,000 hours a year, which is nearly two aircraft and as the A330MMRTs are controlled under Dutch military rules, all the aircraft will wear Royal Netherlands Air Force roundels and serial. Belgium will take 1,000 hours,



Photo: MMF

Colonel Jurgen van der Biezen, RNLAf, was appointed commander of the MMF unit on 16 July 2019.

Luxembourg 200 and Norway 100. When Czech Republic comes on board that will be another 100 hours, which will total 8,900 hours. "I know that's just over eight aircraft" der Kinderen told the author, "but we can handle that." Not all of the hours will of course be taken up by AAR. Many of the countries will use them for transport as well as medical evacuation, with Luxembourg particular interested in the latter. The first NATO A330, referred to as MMF-1, made its maiden flight on November 28, 2018 from Getafe, Spain where it was built. The two-engine aircraft is currently being used for training, aircraft qualifications, and receiver clearance. After being painted in its new livery at Manchester airport, the aircraft (to become T-054) departed back to Getafe on August to continue its flying programme. Der Kinderen continues: "The first four crews, two pilots and a boom operator, are currently undergoing ground training at [Airbus] Seville, Spain. They are from Germany, The Netherlands, and Belgium, the only three nations that provide flying staff.

The MMF flying unit, which is not part of any air force, is governed by a multinational executive board and they selected the commander and deputy commander as well as other key personnel. Aircrews have already been selected from the participating nations to fly the first three aircraft. Colonel Jurgen van der Biezen of the Royal Netherlands Air Force, took on the command of the MMF unit on 16 July 2019, is currently training on the A330MRTT in Seville.

Der Kinderen believes the MMF will be massively appealing to the smaller nations that cannot afford their own tankers. The

Czech Republic is joining, which he hopes will be a catalyst for more nations. Hungary with its GRIPENs is another option, and Slovakia as well when it receives F-16s in 2023/24.

EATC

The European Air Transport Command, formed on 1 September 2010 is based at Eindhoven, conveniently co-located with the future MMF. It is tasked with three main roles: military air transport, air to air refuelling and aeromedical evacuation. There are currently only seven EU countries that own AAR assets but only five of them are EATC members: France, Germany, Italy, Nether-

lands and Spain. Since a dedicated AAR cell was created in 2014, it has become the single point of contact for the national commands and the respective AAR entities. Close cooperation and co-ordination with national AAR agencies has been set up in parallel. Its primary role is to enhance interoperability and to harmonise procedures, and as a result it has successfully pulled together a pool of aircraft which it can share when required.

The EATC currently has 20 air to air refuelling assets from France (three C-160NGs – drogue only, set to be replaced by two drogue equipped KC-130Js), Germany (two A310 MRTTs and one A400M that are drogue only), Italy (four KC-767s – boom and drogue and three KC-130Js – drogue only), The Netherlands (two KDC-10s – boom only) and Spain (five KC-130Hs – drogue only).

In 2018, more than 400 AAR missions were performed by assets from the EATC, which prioritises the available requests against available assets. For 2019, around 350 AAR missions had been executed by mid-September assisting aircraft from Belgium, Czech Republic, Finland, France, Germany, Italy, The Netherlands, Norway, Poland, Spain, Sweden, USA, UK, NATO's Heavy Airlift Wing and NATO's AEW&C force.

The Airbus A400M became available to the requirements of the EATC in early 2018 and in June, 2019 a roadmap for further integration of the four-engine transport aircraft, was announced. On the AAR front it will lead to more training co-operation. As more A400Ms are delivered with air refuelling kits, so the number of air to air refuelling assets will become available to the EATC. Germany is currently operating

Photo: Airbus



Providing some of Europe's A400Ms with air to air refuelling kits will provide the EATC with much needed AAR assets.



Photo: Alan Warnes

Under a Private Finance Initiative, the British company AirTanker provides nine A330 MRTTs to the RAF, although in a time of war that can be increased to 14 with a surge fleet of five.

nine A400Ms configured for AAR kits, but only one is being used on daily operations. Another aircraft is detached to Al Azraq Air Base, Jordan to support the four reconnaissance-configured German Air Force TORNADO IDS and one TORNADO ECR supporting the war against Islamic militants in Iraq and Syria. The A400M has only recently taken over the role from a A310 MRTT, which are expected to be withdrawn from use when Germany, is running all its new A330 MRTTs. Spain is also believed to be interested in acquiring AAR kits for its A400Ms. France, upset with the slow progress of the A400M ordered two KC-130Js in 2017, which led to the first one being delivered on September 20. The French and German Air Force are set to acquire four KC-130Js between them, which will be based as a combined unit at Orleans, France.

The German and Spanish A400Ms along with the French and German KC-130Js assets will augment the eight MMF A330MRTTs, four Italian Boeing 767s and three Italian Air Force C-130Js. The first Royal Netherlands Air Force KDC-10 is expected to be retired at the end of the year and the second will follow in 2021. The introduction of a new generation tanker fleet (A400M and A330 MRTT), will see the air-to-air refuelling domain edging closer to EATC's core business of military air transport. The EATC's current expertise is helping to deliver a centre piece for air-to-air refuelling related matters for member nations.

Command of the EATC rotates between Germany and France. Major General Laurent Marboeuf of the French Air Force took over in September 2018. In one of

his first speeches, Marboeuf spoke of the implementation of a multinational MRTT unit, achieving full AAR capability for the A-400Ms and the arrival of new C-130Js, that will see the AAR fleet under EATC authority tripled within just a few years. Allowing increased interoperability between the partners." Marboeuf will be replaced by a German Air Force commander in September 2020.

To meet the training needs of NATO and its allies, a multinational AAR training exercise, known as European Air Refuelling Training (EART) is run on a yearly basis from Eindhoven. This year's EART 2019, was pooled once again with the Dutch Frisian Flag multinational fighter exercise. During the two-week duration, 60 fighters and five tankers (Royal Netherlands Air Force KDC-10, German Air Force A310MRTT, USAF/100th ARW KC-135R, French Air Force KC-135FR and RAF/Air Tanker A330MRTT) trained in a limited 74,000 sq km of air space. Such training offers the crews unique opportunities, with the tankers requested to train impressive quick turnaround executions in barely one hour – a more than challenging training for both the aircrews and the logistic support.

EATC is looking at the prospect of training together with a major multinational fighter exercise in a bigger and less congested airspace, and is discussing different scenarios to be trained in future. In 2020, for the first time, a MMF A330 MRTT will participate in EART.

UK's Air Tanker

The RAF's VOYAGER Force based at RAF Brize Norton has now been flying for seven

years. It is run by AirTanker, a consortium of Airbus Group, Rolls-Royce, Thales, Cobham and Babcock, after being awarded a £13Bn (US\$25.8Bn) Private Finance Initiative contract on 27 March 2008 to run 27 years. It is the biggest fleet of tankers in Europe but does not contribute aircraft to the EATC. AirTanker has a fleet of 14 brand new Airbus A330MRTTs, that includes nine aircraft for air-to-air refuelling and air transport. The ninth has no underwing pods, carries a civil registration and no RAF roundels and is used for the Falkland Islands air-bridge flown by AirTanker crews. The additional five make up the surge fleet. These would be made available to the RAF at its request, or potentially in the future to allies. Until that time the surge aircraft can be leased by AirTanker to the civil market. Of the nine military registered aircraft, three VOYAGERS are configured as KC2s, with two Cobham 905 under-wing pods, which are used for refuelling fast jets. Five are configured as KC3s, fitted with the Cobham Fuselage Refuelling Unit (FRU) to create a centreline refuelling capability, primarily to give fuel to large aircraft. All of the eight military registered aircraft have the ability to be configured as either a KC2 or KC3.

Having the ability to refuel two receiver aircraft from its wing pods simultaneously, VOYAGER gives the RAF a large capacity two-point tanking capability with a maximum flow from each wing pod of just over a ton (1,200 kg) a minute and two tonnes (1,800 kg) a minute on the centreline.

Meanwhile, the five VOYAGERS that are being made available in the charter market have to be de-militarised. This will see them having their AAR equipment including the under-wing pods and the Cobham FRUs removed at RAF Brize Norton and the aircraft reverting to A330-243s. One has so far been chartered to Thomas Cook. The VOYAGERS are being flown by two squadrons – 10 Squadron and 101 Squadron – which although separate entities, are interoperable. There is always one VOYAGER in the Falklands, which can provide support to the 1435 Flight TYPHOONS on Quick Reaction Alert (QRA) down there and provides an aero-med standby. There is also a VOYAGER on alert at Brize Norton to support TYPHOONS if called into QRA action from RAF Lossiemouth in Moray, Scotland or RAF Coningsby, Lincs which are regular occurrences these days because of Russian Air Force activity. Like the MMF the Voyagers have a fuel capacity of 111 tonnes although they usually only operate with around 100 tonnes and if it runs short of fuel itself can be topped up by another tanker. ■

Cooperative Support for Night Vision and Optoelectronics Equipment

Thomas Willmann

The NATO Support and Procurement Agency (NSPA) achieves consolidation benefits for Allies and Partners.



The NATO Support and Procurement Agency with its head office in Capellen, Luxembourg, brings together in a single organisation NATO's logistics and procurement including armaments acquisition support activities, providing integrated multinational support solutions for NATO, NATO and EU member nations as well as partner nations as its customers.

Products and Services

The expression "NVO" embraces a huge variety of equipment types: stand-alone, integrated or networked thermal imaging, image intensifying, UV, optical and laser systems used for observation, surveillance, target acquisition, aiming, location or target designation including their aiming platform or control system, as well as related accessories and support equipment. For all these types of equipment NSPA provides logistics products and services:

- Acquisition of end items, spare parts and related accessories,
- In-Service Support at NSPA or via contractors,
- Project Management and Technical / Engineering support,
- Training and Documentation,
- Transportation

Besides fulfilling the customer requirement in scope, time, and at the required quality, a primary aim of most activities is the consolidation between the participating nations to a maximum extent in order to obtain economies of scale and ultimately cost-effective solutions.

Acquisition

With its thorough technical and logistics expertise, NSPA can assist nations to determine their technical requirements, develop together with the subject matter experts of the nations a statement of work and manage the entire acquisition process. NSPA's technical experts work in integrated project teams side by side with their colleagues specialised in procurement. Acquisition projects can range from a major requirement-based competition for a certain NVO capability, to procuring authorised and certified spare parts.

In-service Support and Maintenance Facilities

One real advantage is that NSPA possesses a dedicated and qualified optic and electronic workshop for particular NVO equipment. This unique capability allows consolidating and executing maintenance support at a lower cost level. User nations of a certain type of equipment can jointly



Fotos/Graphic: NSPA

Image intensifier tubes are typical candidates for consolidation.

A dedicated area of NSPA's life cycle management is the support to Night Vision and Optoelectronics (NVO) equipment. The support is being provided under the legal framework of the NSPA NVO Support Partnership established in 2015 that currently connects four nations with similar interests. Several additional nations are interested in joining the Partnership.

In the context of the NSPA Support Partnership, NSPA enables consolidation of requirements and offers a highly effective platform for multinational cooperation. Considerable savings for the participating nations have been achieved repeatedly. Life cycle management support

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Technical support based on knowledge and experience

invest in NSPA's capability instead of individually spending on a full national test and maintenance capability. The cost saving is immediately visible when the initial investment can be shared between nations. This in-house capability also allows NSPA, when requested by its customers, to take over spares and test equipment from national maintenance depots, for example, when nations decide to close a

facility. Several examples of this continuity already exist and provide evidence of this invaluable service. The in-house maintenance support is complemented by dedicated support contracts with industry to ensure that all equipment that is in service by the member nations can be maintained and serviced in the most cost-efficient manner.

Technical / Engineering Support

All services and logistics support provided by NSPA staff are centred on knowledge and experience of the subject matter experts at NSPA. Continuous training efforts coupled with low job rotation allow nations to utilise a unique capability. Permanent exchange and cooperation with the national experts through recurring dedicated technical and logistic working groups between NSPA and the member nations further contribute to building and sustaining this knowledge.

Summary

NSPA's capabilities and resources complement those of the member nations in the area of NVO. Consolidation savings have been achieved and the promotion of cooperation further improves the availability and interoperability of nation's NVO systems. Proven achievements and the available expertise motivate NSPA to promote the expansion of the NVO Support Partnership. The services are available to its customer nations.

ESD Spotlight



The Geopolitics of Energy

Joris Verbeurg, Editor Belgium/EU/NATO for ESD

The world's energy system was largely shaped by Anglo-American interests, which favoured much greater competition over access to energy resources on a demand and supply basis. Global geopolitical shifts in the early 21st century have caused a profound transformation of this market-oriented system to which we need to find an answer.

The geopolitics of energy comprises three dimensions: an economic dimension, an ecological dimension, and a security dimension. The economic dimension of the geopolitics of energy is based on the raw material, which is indispensable for modern economies to produce and transport goods. There is a symbiotic relationship between energy and economic development, based mainly on the degree of energy self-sufficiency and on the composition of primary energy supply. On the other hand, energy resources are economic commodities themselves. The rise of the industry is inseparable from the rise of carbon and international business, and fossil fuels are perceived as the driving forces behind technological advancement and economic growth in the industrialized world. The energy needs of the world's population are being driven by the growing economies of China and India, which are using as well. Political tensions are causing more energy dependence and trade issues, while the geopolitical and security aspects of energy resources are becoming more and more prominent. NATO's energy security strategy is based on the concept of energy security, which is defined as the ability to ensure a sufficient, stable, and secure energy supply for the world's population. NATO's energy security strategy is based on the concept of energy security, which is defined as the ability to ensure a sufficient, stable, and secure energy supply for the world's population.

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Slovak Air Force Modernisation

Alan Warnes

Modernisation is the biggest challenge for the Slovak Air Force Commander, Brigadier Lubomír Svoboda. He told ESD recently: "We have acquired two C-27J SPARTANS, taken delivery of three UH-60Ms with another three due in a few weeks, and three more before the end of the year." He went on, "We signed the biggest contract in the history of the Slovak Air Force [worth around US\$1.6Bn] for 14 F-16s and are now looking at GBADs [Ground Based Air Defences]."

Svoboda, a transport aircraft pilot, became the Commander in July 2017 and since then much of his time has been taking up looking at how the new acquisitions are going to fit in.

Transports

It was over ten years ago, on 22 December 2008, that the Slovak MoD announced the C-27J had been selected as its future tactical transport aircraft. The decision came nearly three years after one of the two Antonov An-24RV had crashed on 19 January 2006, claiming the lives of 42 of the 43 personnel on board. The aircraft was returning to its home base at Kosice from Pristina, with 28 soldiers on board who had been serving KFOR (Kosovo Force). According to a subsequent accident investigation report the pilot had descended too early in the dark towards the lights of Kosice. Regardless the age of these two aircraft that had served the Czechoslovak Air Force and then Slovak Air Force for nearly 40 years, the accident led to the second An-24RV being withdrawn from use in 2007. It was another ten years, before both of the Antonov An-26 CURL which had joined the Czechoslovakian Air Force in 1986 and 1987, were retired in 2016.

Author

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Photos: Alan Warnes



The Slovak Air Force only operates a handful of MiG-29AS FULCRUMs, but the situation was made worse on 29 September when one of them was lost. If all goes to plan, the FULCRUMs will be replaced by 14 F-16 Block 70s in 2023/24.

By then, the C-27Js had still not arrived. Protracted negotiations for the two aircraft meant it was nearly six years after the selection had been made that a multi-million-dollar contract for two C-27Js was signed. The first aircraft was delivered to Malacky-Kuchnya to serve with 1st Transport Flight on 24 October 2017, some 49 days later than the contract stipulated, and was followed by the second on 9 April 2018. A delay in the deliveries meant that the Slovak MoD received nearly €900M in compensation. Working alongside the C-27Js at Malacky-Kuchnya are a small number of LET L410s serving the 2nd Transport Flight in the light transport and para-trooping roles. Four L-410-UVP-E20s were delivered between 2009 and 2013.

Fighters

When it comes to fighters and defending defending Slovak airspace, Svoboda has a bigger headache because the Slovak Air Force is operating only a handful of old MiG-29AS and at least one MiG-29UB. "We will keep these jets until the F-16s are delivered," and he added: "Last year, the MoD signed a new contract with the Russians [Rosobronexport] to provide spares support and overhaul until 2023, when the F-16s arrive." That's going to be a tall order, but the

Commander was confident that the MiG-29AS and MiG-29UB will soldier on until then. Unfortunately, a MiG-29AS crashed on 29 September during a training flight. The pilot ejected and although he was hospitalised later, there were no life threatening injuries. Initial reports say the jet, which went through a major overhaul in 2015, ran out of fuel. Bad weather and poor visibility meant the pilot could not land the aircraft at Sliač and instead opted to land at Bratislava Airport but didn't make it.

The SAF upgraded 12 MiG-29A/UB FULCRUMs under a programme dating back to 2005, that included RAC (now RSK) MiG and several western companies. LOK Trencin (LOTN) mediated between RAC and Rockwell during the programme to overcome the security sensitivities of a US company working with a Russian one. The upgrade included new radios, TACAN, anti-collision lights and IFF. In the cockpit, the old gauges were replaced by MFDs developed by Ruska Avionika. RAC MiG Chief Test pilot, Pavel Vlasov flew the first modified MiG-29 in September 2007. Some of the old Cold War jets also received a new digital style colour scheme. The recent crash means the SAF has barely enough MiG-29AS to man anything but the QRA. If need be, Slovakia

could call upon the neighbouring Czech Air Force and its JAS 39C GRIPENs to defend its air space as part of a co-operation agreement signed by both sides in early 2017.

So GRIPENs flying in Slovak airspace is still an option even if the Slovak government signed a contract for 12 Block 70 F-16Cs and 2 F-16Ds on 12 December 2018. The decision came as major blow to Saab, not just because it hoped to add Slovakia to the Czech Republic and Hungary as NATO GRIPEN operators, but because of a politically motivated and damning evaluation report which put the jet in a poor light.

The US\$1.6Bn cost for the 14 new fighters includes a weapons package that the Defence Security Cooperation Agency (DSCA) disclosed as including 30 AIM120-C7 advanced medium range air to air missiles (AMRAAMs), and 100 AIM-9X SIDEWINDER air-to-air missiles. For the air to ground role, the SAF is set to acquire 224 500lb GBU-12 PAVEWAY II, 20 500lb GBU-49 Enhanced PAVEWAY II and 150 500lb Joint Direct Attack Munition (JDAM).

The Block 70 houses the brand new Northrop Grumman AN/APG-83 Scalable Agile Beam Radar and AN/ALQ-211 Advanced Integrated Defensive Electronic Warfare Management Systems, as well as upgraded displays and avionics suite. The new build Block 70s will have their service life extended to 12,000 hours from the 8,000 hours on current F-16 fleets. The new generation F-16 will provide the SAF with a huge leap in capability.

At the Slovak International Air Festival (SIAF) 2018 held at Sliač Air Base, where the MiG-29s are based, Lockheed Martin's F-16 Campaign Lead in Slovakia, Michael N Kelley told the author: "The Slovak F-16s will come off the production facility, now being set up at Greenville in South Carolina, and will be delivered 39 months after the deal is signed." Kelley continued, "The first two aircraft, F-16Ds, will be handed over in the USA and are expected to go to Tucson ANGB, Arizona for pilot and maintenance training. The first ferry cell should arrive in Sliač during March/April 2023."

As part of the deal, 22 Slovak Air Force pilots will commence flying training on F-16 Block 52s at Tucson ANGB, Arizona in 2022 before progressing to the Slovak F-16 Block 70s. According to Brigadier Svoboda "the first six pilots will leave for the USA in October," but as another source told the author, these are to commence with training in the English language before heading to basic flying training.



Introducing nine Sikorsky UH-60Ms into the SAF fleet will modernise the helicopter force. All nine should be delivered by the end of the year.



Another recent introduction into SAF service is the C-27J SPARTAN, which has replaced the old An-26s.

Old Pilots, Old Jet Trainers

Another quandary, the Commander faces is the age of the MiG-29 pilots. Svoboda said, "Many of them are 40 now, so will not be transferred to the F-16s. Instead most will come from the L-39s, currently used for lead in fighter training at Sliač. We can use the MiG-29 pilots and their flying skills as instructor pilots with the training unit, and the eventually any new aircraft (that we) buy."

Like the MiG-29s and the pilots, the L-39s are also getting old now, but the Commander believes they can last for another six years. He told ESD, "We are starting to detail our needs for a next generation trainer as well as a budget and we are looking at all the options out there."

Seven L-39ZAs and six L-39Cs were modified and overhauled by LOT Trencin (LOTN) from 2005 to 2009. The mods included the installation of two new multifunction displays (MFDs), and new antennas visible under the fuselage.

Many acknowledge, stepping from a 70s-era L-39 to fly a cutting edge F-16 Block 70 might be too much for some. With no new jet trainer acquisition programme in place yet, and the first F-16s expected to arrive in 2023, the SAF are in a hurry to find a solution. Although funding and priorities remain a sticking point, as Svoboda pointed out, "A new Ground Based Air Defence system is a priority – a new trainer will come later."

The SAF has a requirement for up to eight new trainers and at Sliač, where the Slovak International Air Festival was held on 3-4 August this year, several of the European manufacturers were exhibiting their solutions at the event. Aero was showing off its L-39CW, used as the L-39NG test-bed. Aero's Head of Sales, Jakub Hoda told the author, "We are offering the L-39NG and there have been some very good discussions with the SAF. We are focussed on not just working with the customer but involving its industry in the NG co-operation." He added, "We have had a long history with LOT Trencin on the L-29 and L-39 in the past. The Slova-

kian Defence Minister Peter Gajdoš even supported us with our request for European development funding, to support the NG's development."

So far no SAF pilots have flown the L-39CW or L-39NG, but it's sure to happen soon. After a nine month lay-off, the L-39NG took to the air again on 14 September. During its grounding, new Genesys avionics were integrated in preparation for the Elbit embedded training system later in the year. Aero has now embarked on an ambitious test programme that should see the L-39NG certified by the end of next year.

Leonardo was showing off its M-345 jet trainer at Sliač, with Gaetano Ferlazzo Head of Eastern Europe Marketing telling the author, "Slovakia could buy them, or could join the Italian Flight Training School at Lecce-Galatina where the M-345 will be based." The first five of 18 M345s are expected to enter Italian Air Force service in early 2020.

Outsourcing Basic Flying Training

There is currently no basic flying training within the Slovak Air Force; instead it is being outsourced to a civilian organisation operating Diamond Da20 KATANA. The student pilots then progress to the L-39ZAM/CM.

Grob are offering the G120TP turboprop trainer present as an option that could replace the older civilian Da20s and part of the L-39ZAM/CM training. The German company's Test and Instructor Pilot Tom Reinert told ESD, "We could offer the aircraft as a first step, before progressing to the L-39NG and then the F-16. There are similar synergies between the two trainers, the Genesys avionics system exists in both platforms and the solution would be affordable."

Reinert flew five SAF pilots as well as the Slovak Prime Minister, Petra Pellegriniho in the G120TP after the recent Sliač show ended.

Helicopters

A handful of old Mi-17Ms are still being operated by the 2nd Transport Helicopter Squadron at Presov. An additional four Mi-17LPZS, converted from the original troop carrying Mi-17M, are flown by the Search and Rescue Flight at Sliač. All the Mi-2 HOPLITEs and Mi-24s have been retired in recent years.

With the introduction into service of nine new UH-60M BLACK HAWKS, the helicopter force is now entering a new era. A contract for four awarded via a foreign military sales contract in August 2015 led to a pair being delivered to the 1st Helicopter Squadron at Presov in August 2017. Defence Minister, Peter Gajdoš said at the formal handover ceremony that they would be used for training, to support land forces and special operations forces, together with domestic crisis management. Back then, four fully trained Slovak aircrews were undergoing training, with six expected to have completed conversion to the type by the end of 2017. A second pair of UH-60Ms followed in July 2018. Another five were subsequently contracted that saw two arriving on a cargo ship at Bremerhaven, Germany, around 24-25 August 2019. They were subsequently delivered to Sliač on 26 August for a handover ceremony before heading to Presov. The final three UH-60Ms will be delivered by the end of the year, with the deal for all nine helicopters valued at around US\$261M. Svoboda is keen to get the fleet operational, "we will also eventually arm them for use in the armed assault role."

A representative from LOTN (Letecké Opravovne Trenčín) which is part of the Slovak Defence Ministry, said the company hopes to sign a contract to weaponise the UH-60Ms with 7.62mm machine guns, as well as sign a deal with Lockheed Martin for the logistics support for the F-16s. ■

Masthead

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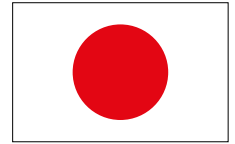
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Promoting International Joint Development and Production



Lieutenant General Shibata Shoichi, Director General of Ground Systems at Acquisition, Technology and Logistics Agency (ATLA), Tokyo

Japan's Self-Defence-Force (SDF) is a modern and well-equipped armed force. The role of the Acquisition, Technology and Logistics Agency (ATLA) and the procurement process were topics ESD discussed with Lieutenant General Shibata Shoichi, Director General of Ground Systems at ATLA in Tokyo.

ESD: What are the responsibilities of the Director General of Ground Systems?

Shibata: I was assigned to my current post, Director General of Ground Systems of the Acquisition, Technology and Logistics Agency (ATLA), in August 2018, after commanding the 1st division of the Eastern Army. After graduating from the National Defence Academy, I became an armour officer in 1986, and have served as commander of units and staff of headquarters and engaged in research and development (R&D) of equipment of the Ground Self Defence Force (GSDF) at the Ground Staff Office. In recent years, I managed R&D of the Type 10 Tank and Type 16 Mobile Combat Vehicle (MCV), as well as the 155mm self-propelled howitzer (wheeled), of which technical tests were completed in March 2019.

There are Director General of Ground Systems, Director General of Naval Systems, Director General of Aerial systems (all Lieutenant Generals) and the Director General of Joint Systems, a technical official. We are responsible for planning important issues such as development of equipment, overall coordinating duties related to research and development from the professional point of view, and assisting the Commissioner of ATLA, my superior. I oversee the ground

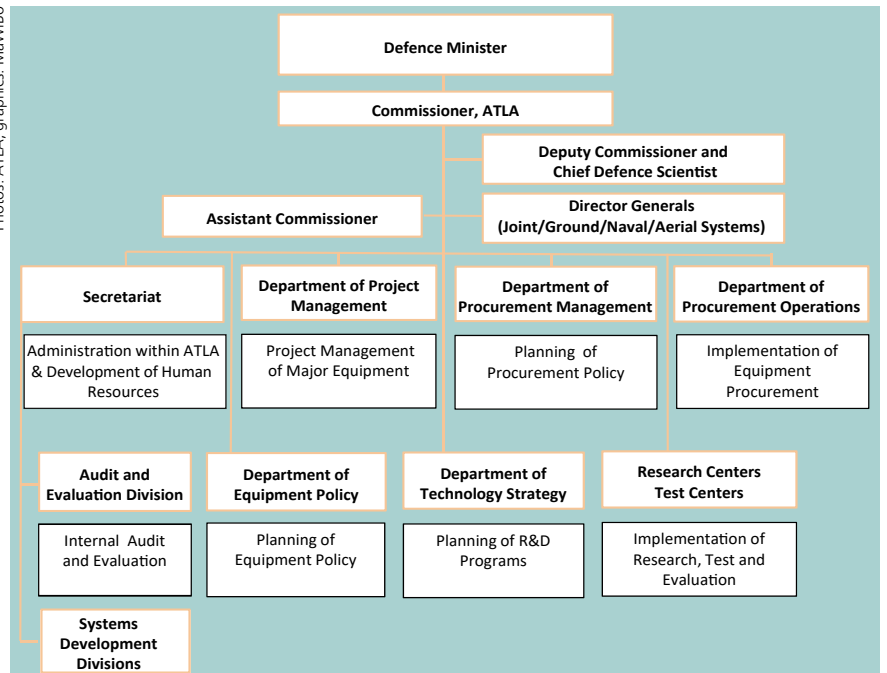
systems and manage ground equipment research and development, procurement and defence equipment transfer and so on, conducted by ATLA, considering needs from the Self-Defence Force (SDF).

We are also focusing on disseminating information in order to promote understanding of our duties and advancing international joint research and development. At the International Armoured Vehicle Conference, January 2019 in London, I gave a presentation on "Achievements in Development of Armoured Vehicles in Japan and Our Future Ambitions." I believe that it was very meaningful, in terms of dissemination of the information to the world.

ESD: What is the policy determining the future direction of ground equipment?

Shibata: The future direction of the ground equipment is determined by government policy. On December 18, 2018, the National Defence Programme Guidelines for Fiscal Year 2019 and Beyond (NDPG) was established by the Cabinet after a decision at the National Security Council level. (The Japanese fiscal year (FY) is from April 1st to March 31st of the following year.) Based on the National Security Strategy, the new NDPG stipulate the basic policy of Japan's defence, the role of defence force, and the target level of specific architecture of the SDF.

Photos: ATLA, graphics: MaWiBo



Main Organisations of ATLA

Under the new NDPG, considering the rapidly changing security environment, we have to ensure the necessary quality and sufficient quantity of defence capability, in order to build a truly effective defence capability that does not lie on linear extension of the past. It is stated that a "Multi-Domain Defence Force" should be built, considering that new domains such as space, cyberspace and the electromagnetic spectrum are critical, and that Japan needs to transform in order to create truly effective defence forces that combine strengths across all domains.

Based on the level of defence force indicated in the new NDPG, the Medium Term Defence Program (FY2019-FY2023) (MTDP) specifically shows the total cost and the quantity of major equipment for those five years.

capabilities, and manoeuvre and deployment capabilities. For the latter, the capabilities related to manoeuvre and deployment of units and strengthening the Amphibious Rapid Brigade, are mentioned in the NDPG. In addition, securing ammunition and fuel, protecting key infrastructure, and ensuring high operational availability, are important for strengthening the sustainability and resilience of defence.

The future R&D of ground equipment will be affected by the capacity-strengthening indicated in the NDPG. Specifically, researching and developing new equipment to achieve a new capability, improving the capability of existing equipment, considering the creation and reorganisation of both units and the ground defence structure: all are affected.



High mobility and firepower are the key features of the Type 16 armoured combat vehicle.

We carry out research and development of ground equipment according to the new NDPG and the MTDP.

ESD: What kind of influence do you expect from the new NDPG on defence equipment R&D planned by the SDF?

Shibata: In order to respond to rapid changes in the security environment, under the NDPG, SDF will prioritise issues and strengthen them as soon as possible. We will acquire and strengthen capabilities in the cyber domain and the electromagnetic domain as well as in the space domain, for capability enhancement required for cross-domain operations. Together with the capabilities in these new domains, we will strengthen our conventional capabilities, like comprehensive air and missile defence ca-

ESD: What is the current total defence budget, and what percentage of that will be spent on equipment R&D? Do you expect this percentage to change in the future?

Shibata: Based on the NDPG and the MTDP aforementioned, the budget for fiscal 2019 was compiled and approved by the bicameral Diet, from the perspective of steadily realising truly effective defence forces from the first year of the NDPG.

The total amount of defence-related expenses in FY 2019 is about €41Bn. The FY 2019 expenses for R&D for the entire MoD amount to about 1.04Bn, or approximately 2.6% of the total amount. Compared with the FY 2018 budget, the total of defence-related expenses in FY 2019 increased by €550M and R&D expenses increased by €200M*.

ESD: Please explain the main phases and outline of the GSDF equipment procurement process.

Shibata: We manage equipment throughout its life cycle. Within its life cycle, its typical process includes establishing the concept, carrying out R&D, and shifting to series production. The main phases of this process are, starting from the concept phase, the research and development phase, the series production and fielding phase, and then the operation, maintenance and disposal phases.

The concept phase establishes concepts such as the operational concept from the military point of view. In the research and development phase, research verifies sub-systems in an environment that simulates the real environment. And in the development, we systematise the elemental technologies and conduct verification tests under the field environment to evaluate whether they meet the requirements of the JSDF. After that, items that pass the deliberations of the Equipment Acquisition Committee of the MOD are approved to be operated in the units. And in the GSDF, they will be in the operation, maintenance, and disposal phase.

ESD: What is the objective of establishment of ATLA, and what is its mission and function?

Shibata: ATLA is a new organisation; established on 1 October 2015 by consolidating and integrating departments related to equipment acquisition within the MOD, with the goal of realising the following subjects:

- Smooth and quick reflection of the operational needs of units on the equipment side,
- Consistent project management throughout the life cycle of equipment from integrated point of view,
- Proactive efforts in new areas (more internationalisation of defence equipment, investment in advanced technology research, and so on) and
- Realisation of procurement reform and maintaining and strengthening of defence production and technical base.

Based on these, ATLA is working on the following tasks:

- Securing technological superiority and smooth and swift reflection of operational needs,
- Efficient acquisition of defence equipment (project management),
- Promoting defence equipment and technology cooperation with other countries,
- Maintaining and strengthening defence production and technical bases and

* The figures don't include SACO (Special Action Committee on Okinawa)-related expenses, US Force realignment-related expenses (the portion allocated for mitigating the impact on local communities), expenses for the introduction of new government aircraft, nor expenses for the three-year emergency measures for disaster prevention/reduction, and national resilience, defence-related expenditures.



The Medium-Range Surface-to-Air Missile CHU-SAM has been improved during the last five years.

- Cost reduction efforts and reinforcement of inspection and audit functions. ATLA's main functions include project management, international equipment and technology cooperation and management, research and development, and defence equipment procurement.

ESD: How do you build cooperative relationships with the Japanese defence industry?

Shibata: We recognise that the domestic defence industry is an important basis for our defence. Japan's defence production and technological base are essential in the production, operation and maintenance of equipment. Therefore, with the domes-

tic defence industry, we have built a close cooperative relationship in the research and development phase, series production and deployment phase, and operation, maintenance and disposal phase, mentioned earlier. In the case of R&D by Ground Systems Development Division, overseen by me, the budget is acquired, the specification is defined, and the defence industry is tasked with building prototypes. After that, through competitive bidding in principle, we will contract with the industry and start prototype production. During prototype production, we conduct several technical reviews, and supervise and instruct on the prototype production plan, technology management organisation and procedures, and the progress of prototype production, to create better equipment.

ESD: To what extent can the Japanese defence industry cover the SDF's requirement? Are there any areas in which ATLA must rely on the capabilities of foreign suppliers and contractors? Does ATLA have business relationships with international contractors, and if so, what is its objective?

Shibata: SDF equipment is characterised by a variety of mission defence equipment supported by Japan's advanced technology. Basically, Japan has a foundation that can produce high-tech defence equipment. Regarding the level of technology, Japan has already reached the top level in the world, except for a few items, and we recognise that Japanese technology for tanks, especially, is at the forefront. For example, the Type 10 tank technologies for compact, low-fuel-consumption, high power powerplant (including powertrain), and for an

automatic loading system not disturbed during rapid acceleration, sudden stops and crossing difficult terrain, are among the most advanced in the world.

Based on the past development of main battle tanks, we have established technology to develop not only tracked but also wheeled combat vehicles, such as the Type 16 MCV, of which we have already started deployment. This carries a 105mm gun and boasts a speed of over 100 km/hour. It is lightweight and compact; it can be transported by the C-2 transport aircraft developed by ATLA. It is also possible to shoot during slalom driving and to track multiple targets simultaneously.

On the other hand, in order to ensure the necessary and sufficient quality and quantity of SDF equipment, we need to acquire high-performance equipment at low price. For this reason, we do not exclude the option of importing from overseas, and we are promoting international joint development and production. For example, in the case of amphibious vehicles, the US-made AAV-7 RAM/RS was imported from BAE Systems; back in 2015 Japan simply did not have the technology or production bases for this.

ESD: What is currently your most important equipment programme?

Shibata: We believe that all programmes for equipment which is needed to fulfil our defence missions are important. The cost of the entire equipment life cycle tends to increase due to the higher performance and complexity of equipment. ATLA selected important equipment for project management from the viewpoint that process efficiency is important throughout lifecycle. Specifically, as at the end of March 2019, ATLA had selected 17 items for project management and three items for semi-project management.

The ground systems equipment for Project Management includes the AAV-7 RAM/RS Amphibious Vehicle, the Type 16 MCV, Type 03 Medium-Range Surface-to-Air Missile (improved), UH-X Rotorcraft, among others, and the ground systems equipment for Semi-Project Management includes the Type 12 Surface-to-Ship Guided Missiles (Advanced).

The GSDF owns various equipment systems. All weapon systems are important because each system functions as a component of the ground combat system of systems. In the future, we believe that we must always consider upgrading, given the rapidly changing security environment. For example, we are conducting research on future amphibious technologies. Amphibi-



The AAV-7 RAM/RS amphibious vehicle is highly mobile both in the sea and on land.



The prototype of the UH-X utility helicopter was delivered in February 2019.

ous capability is imperative for Japanese defence because Japan has a lot of remote islands. This research is for improving the capability of future amphibious vehicles. The technical problems to be resolved by using scale models and Modelling and Simulation include the ability to negotiate the coral reefs found many in the southwestern islands of Japan, high water speed,

and passenger safety. In addition, using the results of this research, we have been conducting Japan-US cooperative research since May 2019, and we will promote efficient and effective research by bringing together the technologies and knowledge of Japan and the United States.

ESD: What is the level of networking and digitisation of GSDF in the field? Are there any networking or digitalising projects being implemented soon or in the future?

Shibata: The GSDF's command and control systems for decision-making support and information sharing among commanders in the field, include: Field Command System (FiCS) for division-level headquarters; Regimental Command and Control System (ReCS) for regimental level; Air Defence Command and Control System (ADCCS) for anti-air combat; Fire Command and Control System (FCCS) for artillery fire control (firefighting) and field communication system, which is the network among the command and control systems. In addition, networking is progressing on various fighting vehicles such as Type 10 tanks. It is considered necessary to

utilise Artificial Intelligence technology, which has made significant progress in the private sector, and private communications technology such as 5G, in future. We are also working on the space, cyber and electromagnetic fields.

ESD: In summary, how do you assess ATLA's influence on the current state of SDF equipment? Is there room for improvement?

Shibata: ATLA is responsible for acquiring SDF equipment. We have to keep first-class equipment ready to operate in the front-line units. However, considering Japan's security environment, it is also true that the severity of the challenge has increased further in fulfilling our responsibilities. Therefore, ATLA should strengthen the domestic defence production and technology bases, and promote joint R&D with foreign countries, and equipment and technology transfer. I think that ATLA should advance, and I will personally make further efforts across all the fields.

The interview was conducted by Gerhard Heiming.



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Police and Paramilitary Forces in France

Joris Verbeurgt

The French police forces are made up of a large number of different units with different operational areas. In recent decades, the French government has launched several attempts to integrate and unify them.

In France, the role of the police is defined by article 12 of the Declaration of the Rights of Men and of the Citizen, dated 26 August 1789. It states that “in order to guarantee the rights of men and of the citizen, a public force is necessary”. That public force should be to the advantage of all, and not merely to the advantage of those who govern it. To prevent abuse of the public force by one individual, three types of police forces were established: the *police nationale*, the *gendarmerie nationale* and the *police municipale*. We'll start with the *Police municipale*, the smallest of the three.

Police Municipal

The municipal police (or local police) is responsible for maintaining order, security, safety, cleanliness and tranquility in the public space at the communal level. It sees to the application of the municipal ordinances, the traffic code, and the town planning code. The judicial officer of the municipal police is the mayor of the municipality who represents the State in municipal matters of law enforcement. The municipal police, around 22.000 strong, is organised in brigades and groups and can have specialised units like motorcycle and horse brigades, or canine and nautical – even brigades equipped with all terrain bikes or with the sole purpose of patrolling at night. The municipal police, giving the mayor's substantial powers in the field of law enforcement in his or her municipality, is sometimes regarded as a remnant of the Ancien regime. Several attempts to merge the municipal police with the National police or with the Gendarmerie have failed so far because of the resistance of the mayors against the confinement of their executive powers and because the two national police forces refuse to allow the municipality police to raise to their level.

"Une Guerre des Polices"

The *Police nationale* and the *Gendarmerie nationale* share the same emergency call number 17 and both fall under the opera-



Graphic: Police Nationale



Photo: Gendarmerie nationale

A Guard of Honour in front of the Gendarmerie Nationale museum in St. Tropez

tional authority of the Ministry of the Interior. At the dispatching, it is decided whether a call will be dispatched to the police (urban area) or to the gendarmerie (rural area). Although both police forces are concerned with law enforcement and fighting crime, there are many substantial differences to be noted. First, the status: members of the national police are considered civil servants, while members of the gendarmerie are part of the French military. The zones in which they operate, are also quite different: although both forces are responsible for the whole of the French territory, the police are more present in urban areas while the gendarmerie exercises its powers in the

countryside. Consequently, 75% of crime and delinquency in France is managed by the police and only 25% by the gendarmerie. Although both police forces have similar missions, they are confronted with quite different problems due to the geographic and demographic differences between urban and rural areas. The gendarme lives in the barracks, while his colleague from the police lives in his own house. Of course, each police force disposes of its own traditions, modus operandi, uniforms, chain of command, equipment, and ranks. All three police forces have more or less distinguished responsibilities and their territorial authority is well defined. However,

there is a huge overlap and sometimes competition between the police forces, leading to a real “guerre des polices” from time to time. In recent years, efforts were made to streamline the different police and paramilitary forces in France, but so far, it has been a very sensitive, difficult, and expensive experiment. The overview of the two most important police forces in France will clarify why that is.

Police Nationale

The *Police nationale* was created in 1941 during the Vichy regime and is attached to the Ministry of the Interior. Its missions are to guarantee the individual and collective liberties, to defend the institutions of the French republic, to maintain peace and public order and to protect individuals and property. The jurisdiction of the *police nationale* extends to the entire territory of France. At the head of the national police is general director Eric Morvan, a 62-year old administrator from Nevers. The national police is around 150.000 officers strong.

Nine entities fall under his direct control: besides a unit to support the decision making process, an information and communication service, and a service that conducts research with regard to the history of the French police, there is a branch for the coordination of the fight against drugs, a service that is concerned with victims of crime and terrorism, a unit in charge of the security on the public transport network, and one in charge for big public events. Two units that have become prominent the last years are the UCLAD, the unit that coordinates the combat against terrorism and that is in charge of evaluating the terrorist threat level, and the RAID, an elite unit that is part of the Intervention Force of the *Police nationale*, established after the Munich Olympic games of 1972 and always ready to intervene at major crises.

General director Morvan also directs 11 directorates: some in a more supportive role, like the human resources and competences directorate, the directorate for international cooperation, or the directorate for public institutions, including the National Police Academy or the National Institute for Police Science; the directorate for logistics, purchase and equipment, as well as the Music Chapel of the police, also fall into that category. The General Inspection of the National Police, the service in charge of inspecting the services and units of the police by conducting audits, formulating recommendations and by investigating complaints against police officers, concludes the list of the supporting units and services.



Photo: Police Nationale

Members of the Police Nationale are considered civil servants, while members of the Gendarmerie Nationale are part of the French military.

At the operational level, there is first of all the protection service, in charge of the protection of the president of the French republic and of French or foreign government members or other authorities that need protection. The protection of important buildings and ceremonies is also part of the job. Different units offer either static or mobile protection.

Four central directorates are in charge of the real police work: the Judicial police, Public security, Border police, and the *Direction Centrale des Compagnies Républicaines de Sécurité*, commonly known as the CRS.

The Judicial Police

The Judicial police has a general staff and 7 specialised services; it counts 5300 officers that concern themselves with crime, economic and financial cases, police techniques and scientific research, and external affairs. Its area of operations is the whole of the French territory, including the overseas territories, but excluding the prefecture of Paris, which has its own *direction régionale de la police judiciaire de Paris*. There are 11 territorial directions, 2 regional (Versailles for the city of Paris and Ajaccio for Corsica) and 9 interregional, including one for Antilles-Guyana. Its activities are aimed at preventing and countering specialized, organised and transnational delinquency and crime. It is also in charge of the surveillance of casino's and race fields. The Judicial police is also actively engaged in the fight against terrorism and in international struc-

tures that favour cooperation among police forces. In organised crime, the following main topics are handled by the Judicial police: great-scale financial delinquency, the trafficking of drugs and of human beings, serious violence against persons, the fight against counterfeiting, the trafficking of cultural goods, the fight against cyber-crime (since 2000), infringement of commercial law and the fight against financial and economic fraud. In 2002, so-called Regional Intervention Groups were established in each territorial direction to counter the underground economy and the different forms of organised crime that come with it and form a source of insecurity and social disintegration in numerous “sensitive” quarters.

Central Direction for Public Security

The Central Direction for Public Security guarantees public safety and security all over the French territory at any time. It is permanently present in the streets of France and guarantees safety and security for persons and their property on a daily basis. It also assumes a big role in crime prevention. As such, it is the most important active *Direction centrale* of the *Police nationale*. Its missions are as follows: interventions to support people that called the emergency number 17; the fight against crime and serious city violence, countering road insecurity, countering drug trafficking and fighting hooliganism at major sports events (for which a national division was created).

Photo: via author



The Police Municipale is the smallest of the three French police forces.

Other missions include the prevention and the dissuasion of crime through an active and visible presence in the public space and through the development of partnerships with local actors, like schools, social workers, etc. Finally, the Central Direction for Public Security oversees major events like street demonstrations, the transport of important people and the protection of sensitive places. It is responsible for implementing these measures and commanding the public order police units. It covers 40% of the French population, and 617 or 75% of the 'sensitive' quarters, being the equivalent of 1596 villages. It handles over 62% of the crimes committed on French territory.

Border Police

The French Border Police (*direction centrale de la police aux frontières*) was created in 1999 and profoundly reorganised in 2003. It comprises a general staff, a 'new technologies' unit, a railway police, and three departments concerned with international affairs, the fight against illegal immigration as well as human and material resources. The railway police is responsible for assuring the security of the French railway network, together with its operators. For that purpose, it is composed of 7 special units, '*Brigades de Chemins de fer*', with each brigade responsible for a certain zone. It also takes care of controlling the railway traffic to neighbouring countries and takes part in mixed patrols with police officers from Belgium, Germany, Switzerland, Italy, and Spain. Needless to say that the railway police plays an important role in the fight against illegal immigration, particularly on the railway network. The Department for International and Transnational Affairs and Security is concerned with the legal framework regarding transnational transport. It produces texts, takes part in national and European discus-

sions regarding the regulation of transnational transport, answers legal questions with regard to border control in close cooperation with other services and administrations. It also contributes to European legislation and institutional cooperation to enhance the safety and security of international transport via railways, harbours and airports that fall under the competence of the Border police.

The department for combatting illegal immigration coordinates, at the national level, the fight against all forms of illegal immigration and workers without a permit. It is responsible for the deportation of illegal immigrants and analyses migratory fluxes. The last department of the Border police manages the budget and the human and material resources of this central direction. Finally, the Border police assures the operational coordination at the European level of the 10 police and customs cooperation centres with Germany, Belgium, Spain, Italy, Luxembourg and Switzerland and of the 4 police stations that it shares with Germany.

Compagnies Républicaines de Sécurité

Created by General De Gaulle in the aftermath of the liberation of France in 1944 to contribute to the reestablishment of law and order in the French republic, the *Compagnies Républicaines de Sécurité* (CRS) are mobile units that form the general reserve of the *Police nationale* specialised in preserving order. Throughout the years, the CRS has started doing other police work too, like traffic control, assistance at sea and in mountainous areas, the fight against petty crime, the surveillance of ports and airports, and escorting and protecting VIP's and their residences in France. Most of all, however, the CRS is known for the suppression of riots and urban disturbances, for example, the recent uprising of the *gilets jaunes*.

The territorial organisation of the CRS consists of 3 levels: a general direction within the National police in Paris, as well as 7 regional directions and territorial units. There are 60 companies for keeping order, 1 company dedicated to the protection of VIP's, 9 highway companies, 6 regional motorcycle units, a CRS for the Alps and mountain sections, and the music chapel of the French police.

Gendarmerie Nationale

The gendarmerie is the successor of the *maréchaussées*, an embryonal police force dating back to the Middle Ages. In 1791, while the French Revolution was raging, the *Gendarmerie* (deduced from *les gens d'armes*, or 'the people who bear arms') was established to bring the police forces under the control of the revolutionary regime. Since then, its responsibilities have gradually been expanded. Army General Richard Lizuray is the general director of the Gendarmerie nationale since 2016. He is the head of the general directorate that encompasses a department that controls and inspects the gendarmerie (the IGGN) and advises the general director in policy matters, an organ that studies and reflects on the evolution of the military role of the gendarmerie, a Planning Centre and a Crisis Management Centre in which a variety of crisis management experts support the director general, territorial units or other administrations with their expertise. Four central offices complete the general directorate: an office that coordinates the fight against illegal workers in France, an office for itinerant cross-border crime gangs, an office for crimes against the environment and public health, and an office with regard to crimes against humanity, genocide and war crimes.

The authority of the gendarmerie extends to the whole of the territory of France, in peacetime as well as in wartime, and in all types of crises that may occur. Securing and maintaining public order and guaranteeing general public safety and security are the two missions of the gendarmerie.

The military organisation of the gendarmerie, from the general direction to the basic unit of the mobile (MG) or the departmental gendarmerie (DG), allows a permanent operational posture, a short response time in case of an incident, and a large capacity for mobilisation. Its manoeuvrability and adaptability makes it able to respond to any sudden crisis, anytime, anyplace, with deployable command posts, units and support units.

Gendarmerie Mobile

The mobile gendarmerie is specialised in maintaining public order in the whole spectrum of crises. The general reserve of the gendarmerie is at the disposal of the government, not only for police tasks, but also for purely military missions, side by side with territorial units. It can be deployed on the whole territory of France, including the overseas territories and the Paris region, and on theatres abroad, within the framework of military operations.

The GM counts approximately 13000 personnel, divided over 109 squadrons, 17 groupings and 1 armoured group. It is responsible for keeping order and for fighting crime and delinquency on a day to day basis. On average, a GM squadron is sent on missions outside the garrison for 180 days per year.

Besides maintaining or restoring public order, the following missions are trusted to the GM: it can function as reinforcements for the departmental gendarmerie, particularly in the so-called 'zones de sécurité prioritaires' (ZSP), where they can be deployed for safeguarding and security missions, in-

terventions within the framework of judicial actions, protection of persons and property in sensitive sectors, etcetera. The protection of sensitive buildings (like the embassies in France) or escorting VIPs are also part of the package. Military operations abroad and the protection of French embassies in foreign countries are also missions in which the GM can take part. Last but not least, the GM can also be ordered to participate in the execution of special plans from the government, like counter piracy operations or the fight against illegal immigration.

Gendarmerie Départementale

The departmental gendarmerie is concerned with general public safety. Day and night, the GD is active to guarantee the protection of persons and property, to gain information, to alarm, and to come to the aide of persons in distress. The GD is also keen to keep in contact with the population and to master the fluxes of people and traffic on its territory. With 51.000 personnel in active service, the GD is a formidable police force that takes care of the adminis-

trative, judicial and military tasks that are confined to it.

While the GD operates in rural and semi-urban areas, a brigade is the basic unit responsible for a defined territorial zone. A brigade has lot of autonomy and its chain of command, its human and material resources and its support functions can vary significantly in function of the missions it has to accomplish. A quiet rural area or a vibrant suburb, a mountainous area or a coastal region, all require a different approach to which the gendarmerie is adapted. If needed, specialised units of the territorial army, e.g. engineers, are at the disposal of the *Gendarmerie départementale*.

This concise overview of the police and paramilitary forces in France show that, from a policy point of view, the situation is complicated. In the last decades, several initiatives have been launched by the French government to unify and integrate the different police forces for economic reasons and for reasons of efficiency. However, the resistance against reform is harsh, within, and outside the respective police forces. ■



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Northern Innovation for the 6th Generation



Photo: Team Tempest

Georg Mader

In view of ongoing upgrades for TYPHOON, RAFALE or GRIPEN, it seems far off today to speculate about which aircraft will one day succeed these types. Nevertheless, their successors are already appearing. Several voices call for a joint European fighter project, as the three major European manufacturers should not compete for small quantities on the world market.

At the moment, however, it looks as if at least two concepts are starting side by side. In addition to the German-French-Spanish NGF (Next Generation Fighter), which was presented this year as FCAS (Future Combat Air System) in Paris, the British are pursuing a similar high-tech project under the name TEMPEST, and Sweden and SAAB want to join this British feasibility study. Perhaps the British were looking for a good-sounding name from the rich history of the RAF. At the annual RIAT Air Tattoo in Fairford this was jokingly highlighted, because in 1944 the Hawker TEM-

PEST was the improved successor of the fighter bomber TYPHOON. And now the TEMPEST is supposed to once again succeed the TYPHOON. "Initiated" is the appropriate term for the status of what was first presented in Farnborough in 2018. A first prototype should be in the air around 2025/26 – a few years ahead of the continental EU rival. But none of the ministers, captains of industry, air chiefs or even the British programme director RAF Air Commodore Dan Storr or his Swedish colleague Michael Cherinet wanted to predict what the "Team TEMPEST" would one day produce. Not even whether

TEMPEST Fact Box

The current TEMPEST mock-up shares design similarities with other LO (stealth) aircraft, such as a planform reminiscent of the F-22, with a saw-tooth trailing edge as used on the B-2A or X-47B, trapezoidal twin tails like those of the YF-23 and intakes similar to the F-35. The manned/optionally-manned design is quite large, clearly bigger than F-35. There are no official measurements but if the 1:72 resin model shown at RIAT is more or less accurate, it would indicate a length of 18 to 19 metres and a span of 13,5 to 14 metres. As it looks today, it is clearly "size driven" by the requirement for a large internal payload bay to accommodate weapons, sensors or additional fuel, while still having sufficient performance and agility to survive challenging combat environments. From many conversations with pilots and mission leaders, the author now knows that any FCAS would be larger than an F-35, which is often considered too small, too short and with an insufficient (internal) payload for potential future challenges.

Photo: BAE SYSTEMS



The TEMPEST is intended to be a 6th generation successor to the UK's TYPHOON.

Author

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a prototype would look like the plastic model standing in front of the VIP chalets. Nevertheless, all project partners are sure that all emerging and future technologies and unorthodox ideas will be incorporated. For example, artificial intelligence, 3D printing of intelligent materials, ionized plasma,

a fully virtual cockpit, directional energy/laser weapons, optional unmanned operation including collaboration on swarm intelligence, network cooperation with the – yet to be developed – novel unmanned effectors MOSQUITO or LANCA (Lightweight Affordable Novel Combat Aircraft).

Supercharging the System

At Farnborough, a TEMPEST pavilion showed all these innovations via models, graphics, videos and housed all the various programme partners like BAE-Systems (air-

frame), Rolls-Royce (propulsion), Leonardo-UK (avionics) and MBDA (Weapons). All of them are "Team TEMPEST, under the coordination of a so-called RAF Rapid Capabilities Office (RCO), a streamlined procurement unit established two years ago and led by Air Vice Marshal "Rocky" Rochelle. According to him, the RCO has "injected a sense of innovation and urgency by supercharging and not subverting the system." Like all the other participants, he stressed that in order to build the TEMPEST aircraft, the British must be open to attracting other programme partners, and he stressed that they will be addressed all over the world, with talks being held with Japan, India, South Korea or Saudi Arabia. As for Europe, it is only Italy that remains as a nation with the necessary experience and industrial base.

A Viking Spirit of Discovery

At Fairford on 19 July 2019, the realisation of Britain's ambitious project came a good deal closer. The day before, British Secretary of Defence Penny Mordaunt (meanwhile replaced by Ben Wallace) and her Swedish counterpart Peter Hultqvist – with SAAB behind – signed a £2bn FCAS feasibility-study, to be concluded by the end of 2020. In the presence of about 50 airchiefs from all over the world, British Minister for Defence Procurement Stuart Andrew, Minister Hultqvist, RAF Chief of the Air-Staff ACM Sir Stephen Hillier, and Chief of Staff of the Swedish Flygvapnet Gen. Mats Helgesson, their partnership. For the industry, BAE-Systems' CEO Charles Woodburn and SAAB's Chairman of the Supervisory Board, Marcus Walenberg, repeated brave and far-reaching plans of what the future might bring. All of them as well as their technical programme managers were subsequently available for press talks.

Does all this mean that the Swedes would also put TEMPEST and its unmanned "wing men" into service, as it seems quite certain for the RAF? No, not for the time being. Officially, no joint development contract is planned at the moment. There is only one agreement with Sweden to support Britain in researching future multiple collaborations that could lead to the later development of combat aircraft. At the moment it is about researching the technological possibilities to which both renowned development departments in Warton and Linköping will contribute. The agreement is not as binding for Sweden as the British had hoped. Between the lines and in the conversation, however, the impression was clearly one of a determined joint departure.



Photo: Georg Mader

Some observers see the Dassault-led FCAS unveiled in 2019 at Paris Le Bourget Air Show as a competing aircraft to the TEMPEST.

Not much out there so far

And this means that for the foreseeable future two 6th generation European air combat systems are under development. Both have teams, and even if – in contrast to "Tempest" – one cannot climb into a Dassault-led continental mock-up, the two are leaders and openly look for other strong partners. Besides them, there are not many other projects worldwide – at least nothing is known so far. The USAF is researching the 'Penetrating Counter-Air 2030', and there are also plans in China and Russia, accompanied by beautiful artist impressions that often resemble science fiction fantasies. In Japan there is the Mitsubishi F-3 project, which is derived from a flown small X-2 'Shinshin' demonstrator. In Turkey there is the TF-X project, in India there is AMCA and the Korean-Indonesian KF-X design. However, these will be all 5th generation developments developed step by step anyway – from sophisticated wind tunnel models to 1:1 models.

Backup for TYPHOON and GRIPEN

Fairford has clearly confirmed the existence of a Nordic axis from the North Sea to the Baltic, at least when it comes to the perception of threats and the pursuit of a future air combat lead. However, both countries need the available services much earlier. The Swedish-British partnership means that Leonardo-UK's AESA radar will be available in the future Gripen-E, as will SAAB's self-defence subsystem in the TYPHOON. And both technical programme managers emphasised that, as far as possible, all innovations and solutions found or achieved on the long road to TEMPEST should again flow into the two platforms TYPHOON and GRIPEN-E, which are expected to fly well into the 2040s. Although the latest version of the JAS-39 was recently "too young" for a Swiss country evaluation, its complete separation of structural hardware, flight control software and mission and/or later added

software-based capabilities, as described by SAAB as a "giant smartphone", is seen as an appropriate contribution to a future air combat system such as TEMPEST.

Railway Wagons full of Tax Money

Given the enormous financial and intellectual resources that governments will have to provide, it will be exciting to see whether, over the course of several legislative periods, the two current designs will continue to be pursued or whether, in the end, one will be financially forced into a single European combat aircraft project. European defence officials and business leaders such as Leonardo's CEO Alessandro Profumo or the former director of the Eurofighter, Volker Paltzo, warn it is irresponsible to repeat the mistakes of the past when European efforts were divided into the three current "Eurocarnards". But when listening to the British and Swedish officials at Fairford, one realises that there are different threat perceptions and operational approaches on both sides of the channel and the North Sea and that there are sufficient resources to develop two competing systems. Another general approach for a future FCAS became apparent: The British and Swedes see the Franco-German project led by Dassault more as economically motivated to maintain industrial capacity and as a high-tech job engine, while they themselves see TEMPEST and its efforts only in the focus of what their air forces will have at their disposal to win a future air battle. Speaking of Leonardo, the UK branch of the Italian state conglomerate – with 7,000 employees at Yeovil, Edinburgh, Luton, Basildon, Southampton and Bristol – at Fairford, Leonardo UK was commissioned to provide a testbed aircraft for subsystems and aggregates for the future TEMPEST, based on a Boeing 757 and available from early 2020 on. By the way, Italy was also strikingly represented in the programme of 2019 RIAT with the PAN "Frecce Tricolori" team and T.346 MASTER, C-27J SPARTAN and an AMI TYPHOON in solo displays.

The RAF's last TYPHOON

In early August 2019, the RAF's final Tranche 3-standard TYPHOON made its second flight from BAE's Warton final-assembly site in Lancashire. It is now undergoing sub-equipment installation and trials and will be handed over later this year. The RAF is currently flying an active fleet of 116 TYPHOONS, the oldest of which are 14 years old. Under current plans, the type should remain in UK frontline-service until 2040 and then to be replaced by the TEMPEST, while operating alongside the 138 STOVL Lockheed Martin F-35Bs. A cut in the latter's numbers was clearly denied at RIAT-2019. ■

Photo: Georg Mader



On 19 July 2019, BAE Systems CEO Charles Woodburn and Mark Wallenberg of SAAB shook hands after formally announcing their cooperation in the TEMPEST project.

Talking TEMPEST at RIAT

The recently sealed British-Swedish partnership is sponsoring an extensive GBP2Bn UK-funded feasibility study to develop a combat air system to be available by 2040. Sweden (SAAB) will now bring expertise and development to this Future Combat Air System Technology Initiative (FCAS-TI), but for the time being will not join Team Tempest, the planned centrepiece of British efforts. Following the opening of the Royal International Air Tattoo (RIAT) on 19 July 2019, ESD's Georg Mader was able to conduct interviews with the key people in the TEMPEST initiative. A selected and abridged summary:



Photo: Georg Mader

UK Defence Procurement Minister Stuart Andrew talking to ESD's Georg Mader

ESD: TEMPEST has been around since Farnborough 2018. What are the main features of the initiative, what are the objectives?

Andrew: With threats accelerating, with competitors constantly seeking to gain an edge at every opportunity, the UK must think the long term – to guarantee we can dominate the skies for the decades to come! And by launching our Combat Air Strategy, we went towards replacing TYPHOON from 2040 on. That Future Combat Air System (FCAS) – expected to yield an initial report by late 2020 – looks for gamechanging while affordable future technologies. It lays the foundations for our tomorrow air warfare efforts.

ESD: And within these efforts, TEMPEST is what?

“Sweden is an ideal partner”

Interview with Stuart Andrew, then Minister for Defence Procurement at the UK MoD, meanwhile Government Whip

Andrew: A pillar! It is now put on an initial track with “Team TEMPEST”, a co-funded partnership between government and our industry partners towards aligning incentives, pooling expertise and sharing costs. And of course others are invited to discuss or participate, yet we even underline the notion of international cooperation.

ESD: Reportedly with nations like India, Italy, Saudi-Arabia, Turkey, and so on?

Andrew: There is a very good possibility of other strong partners coming along – and that also may very well include nations from outside Europe.

ESD: Now Sweden has become your first confirmed partner in this feasibility study, but is not directly joining Team TEMPEST. On what level does this partnership play out?

Andrew: On important levels, no doubt. Since launching our strategy and study, it rapidly became clear that Sweden is an ideal partner. Our past cooperation has created the game-changing METEOR BVR missile and they were the first introducing it operationally. While for now SAAB will not join our UK's Team TEMPEST, Sweden will work with the team to deliver benefits to both

nations, also between our two industries. In regards to cost-efficiency, by aligning common requirements and systems-architecture and thus keeping also our today's platforms current and a technological bridge to our future ones. With this experienced aviation nation joining, it shows that TEMPEST is not yet another paper plane, like some gloomed it would never happen.

ESD: In light of TEMPEST showing up on distant horizon, is there anything to change on the 138 F-35B LIGHTNING-II for RAF and RN, like cutting their numbers?

Andrew: No. I have no such information in this direction.

ESD: How relevant is Brexit in this context?

Andrew: I'm surprised this subject did not come up in your very first question. No, many of our collaborations we have undertaken in defence, happened outside of EU. And of course we remain members of NATO, closely working with our allies. Even as we are leaving the EU's institutions, we are not leaving Europe and are also not stepping off the world's stage. No, we are here to stay. Especially in defence – even maybe better off.

“For us it is not about TEMPEST”

Interview with Peter Hultqvist, Sweden’s Minister of Defence

ESD: Minister, why did Sweden opt for the British way towards a 6th generation fighter jet and not for the European Dassault-led project?

Hultqvist: This has many reasons. Britain is one of Sweden’s closest partners and friends and we signed this partnership as a confirmation of our bilateral relationships. And – Brexit or not – Sweden has a strategic interest in the future relationship with the UK. The two nations already participated in recent joint exercises in the Arctic and over Eastern Europe, with the largest British military presence in the Baltic Sea region in a 100 years. This is a clear signal to act together if needed, also in common threat assessment. And the subsequent aspiration, to pursue towards the cutting-edge up there – and not in the first place for an industry-political tool.

ESD: Is Sweden’s assumed strategic environment really as similar as the British one in order to explain your bilateral approach?

Hultqvist: Assumed? We both live in more challenging times, in both our strategic environment but also beyond. In our East, we see a more assertive Russia which repeatedly has shown to use military means for political and strategic goals. We saw that in Georgia in 2008 and with the illegal annexation of Crimea in 2014, and with the ongoing aggression in Eastern Ukraine. We also see a more aggressive Russian military posture in the Baltic region. By deploying new long-range weapons, conducting “snap exercises” and by acting aggressive, provocative and sometimes careless towards Western sea vessels and aircraft. Russian behaviour has affected the security situation in a negative way, no doubt. In this environment, we first need to take responsibility for our own national security. Thus, Sweden is re-enforcing our national defence, including overall resilience in “total defence”, which also relates to hybrid warfare. But to keep stability in Northern Europe, in the Baltic region and further in all Europe, we also have to deepen our bilateral and multilateral defence and security cooperation with others. In these challenging times, we need more cooperation, not less. Added to all this, we face a more active China, with implications for both our wider security. Not only within Europe,

but across the Atlantic as well, for our American and Canadian friends. And a strong transatlantic link is remaining vital for European and American security.

ESD: This is why you both see the air component as the most important element?

Hultqvist: Naturally! Air-combat capability and its tools and endurance is the key component of our defence strategy and posture. It is defined by parliamentary decision as a national security interest. And Sweden has a long tradition of advanced aircraft technology, of world-respected fighter-systems. But to continue developing cutting-edge technology, is time and resources-consuming, a great challenge to any nation. Both UK and Sweden intend to remain on the forefront of combat air, to meet our national security objectives and to protect our nations also from above. And for that, you have to go for “air dominance” ability, in your airspace and over the region. Not only via aircraft, but with radar, crypto-datalinks, and so on.

ESD: So it is both a security-based as well as an industry-driven approach.

Hultqvist: Well, in such a quest it turns out as of mutual security interests, to look to go with a partner who is just as skilled industrially as he is operationally. Both our nations have the industrial base to provide our countries with the needed future air-combat tools, as well as to constantly upgrade our existing GRIPEN and TYPHOON. But there are justified thoughts however, what might come after GRIPEN in a more distant future. That is why Sweden now signed up with the UK to analyse operational, economic and industrial prospects for partnering towards what is called the 6th generation. This is to the benefit not just of our own air capabilities but also for our international GRIPEN partners. One purpose is to also explore the feasibility for an affordable and substantial industrial base for the UK and Sweden. By conducting



Photo: Georg Mader

Sweden’s Minister of Defence Peter Hultqvist talking to Georg Mader

these studies, we lay the foundations for well-informed decisions, regarding future steps of technical and combat-air collaboration. We thus recognise each other’s strengths and we complement each other’s industrial ability. We see great potential in this cooperation; we have done a lot together and will do a lot good together in the future.

ESD: What exactly did you do jointly in the air-combat segment?

Hultqvist: This began post-war, with SPITFIRES and later early British jets in Swedish service, like the HUNTER and British engines in Swedish jets like the AVON. Today is illustrated by Swedish-made self-defence deployed on TYPHOON, or the AESA-radar for GRIPEN-E coming from Leonardo-UK. Or the METEOR air-to-air missile, manufactured at MBDA in Lostock, jointly developed by Sweden and the UK.

ESD: Does Brexit affect your collaboration?

Hultqvist: I have been assured once more that the UK will remain a partner in the current and future security situation in Europe, that they would fulfil all their commitments and that one can continue to count on them. Anyway, for Sweden it is important to look for an equal-footed partnership with the UK in any future aircraft programme. With half an eye on export markets, at the moment for us it is not about TEMPEST but about upgrades to GRIPEN-E resulting from research for TEMPEST. An interesting merge of 4+ and 6th generation. I’m keen to see US-reactions.



**BAE Systems CEO
Charles Woodburn**

ESD: It looks as if TEMPEST has been getting into gear since Farnborough 2018.

Woodburn: I am proud that this UK-initiated FACS has now become a true international endeavour. But it is not just about TEMPEST as another new aircraft. Today, it is on us to define and delivering all the future air-based capabilities required beyond TYPHOON. In tradition for over a century, in working in partnership with the RAF, our industry has developed and delivered

“You can’t have prosperity without security”

Interview with Charles Woodburn, CEO BAE SYSTEMS

air-combat technologies in support to the UK’s position as a world-leader in fielded and deployed air-power. And at Farnborough last year, I was delighted to be part of the launch of the UK’s combat-air strategy and acquisition-programme, the signing of the “Team TEMPEST contract and the unveiling of our concept-model aircraft, which outlines a bold and exciting vision for the future. And the team is on track to delivering 17 European-firsts and 7-world firsts. Since launching that national endeavour, we have however consistently talked the importance of international co-operation in making this vision a reality, via collaboration between nations and industries. By their very nature such programmes are best delivered by sounding and decent partnerships. Thus in this undertaking we again said, that we want the best players involved, nations and industries that share our vision to deliver a world-leading, competitive and deterrent next generation combat-air system. Like Sweden.

ESD: What does the programme and its vision mean to the UK industrial sector?

Woodburn: You can’t have prosperity without security. Of course, this also is an opportunity to bolster our already world-class combat sector, which here in the UK has an annual turnover of more than £6.5Bn, while sustaining more than 18,000 highly skilled jobs and further 28,000 jobs in the supply-chain across some 2,000 companies. The military aviation sector generated 85% of all British arms exports in the last decade. And the sector today is resembled in Team TEMPEST by LEONARDO-UK and MBDA-UK. Or by experienced RR, with their EJ-200 proven exceptionally capable in service in powering the TYPHOON. And a fruitful collaboration with Sweden is up and running. LEONARDO-UK provides the wide-field RAVEN E-scan radar for every coming GRIPEN-E aircraft, delivering advanced targeting modes. SAAB also offers LEONARDO’s world-leading BRIGHT CLOUD active-decoy as an EW-option for all GRIPEN models. MBDA and SAAB worked together with other partners to realise the fantastic METEOR BVR-missile, that today arms both RAF TYPHOON and Swedish AF GRIPEN. On all that, we will build-up towards 6th generation.



**Marcus Wallenberg, Chairman of
SAAB AB**

ESD: That shouldn’t be so new for you, should it – the baptism of a new “baby”?

Wallenberg: No, it isn’t. While I was extremely happy to share the stage here, representing a company that has a long tradition in working with the British partners for decades, you have to reflect that my family was active in industry, finances and support of contemporary and basic science for 160 years, to invest in research, education, inno-

“So we have to evolve, too”

Interview with Marcus Wallenberg, Chairman of SAAB AB

vation and development. And 80 years ago, we joined efforts to set up, to create the defence-company SAAB. With the single purpose to support the defence of Sweden. And that is still the purpose today, with my family still involved in SAAB. Their aerospace heritage, with more than 5,000 aircraft built over several decades, includes the DRAGEN, VIGGEN and GRIPEN fighters. But also the full spectrum of air-, land- and sea-capabilities. Thus there is so much genuine Swedish in that new step – and that’s why I am nevertheless somewhat exited.

ESD: And now, this is all about future technologies, some maybe years away until it emerges from the labs.

Wallenberg: Yes, fascinating, isn’t it? But they all are born out of current ideas and cooperation. Like the one we are already actually involved with the UK, the RAF. Our EW and self-protection systems supported RAF-pilots in HARRIERs, TORNADOs and now in TYPHOON. And our GRIPEN supply chain here in the UK supports thousands of UK-jobs. Our GIRAFFE-radars are a critical com-

ponent of the SKY SABRE air-defence system and we also have participated in deployment of METEOR. So, our company’s commitment to the relationship with the UK has stood strong for many years. And we expect that to grow, both in spirit and presence over the years to come. At the same time during these decades of partnership, the world has evolved – as have the threats we are looking into face today. And so we have to evolve, too. That’s when new technologies come into play. One of our recent projects – called WASP – involves AI, autonomous systems, quantum-computing and related software engineering. And it turns out as one of our largest industrial research-projects ever. It will be extremely important to use these new technologies as a part, yet as a base for the FCAS feasibility. In this context, just last month we opened the SAAB-UK Innovation Hub at Imperial College at White City campus, an initial step for further R&D spending here in the UK. For SAAB this in order to keep up and stay ahead of technological development. Like we also do with Brazil on GRIPEN-E and with Boeing on the T-X.

UK and Italy to Partner for TEMPEST

Luca Peruzzi

At DSEI 2019, leading British companies including BAE Systems, Leonardo UK, Rolls Royce and MBDA UK, together with Italian industry players represented by Leonardo Italy, Elettronica, Avio Aero and MBDA Italy, signed a Statement of Intent (SOI) to partner on the TEMPEST programme. UK and Italian governments had previously declared to cooperate on future Combat Air capabilities, including the TEMPEST programme. The SOI outlined a number of commitments, including "closer Government alignment on future Eurofighter TYPHOON enhancement" as well as "deepening discussions on TEMPEST military requirements." The SOI also includes the commitment "to develop a combat air roadmap, identifying opportunities to integrate advanced technologies from Eurofighter TYPHOON into TEMPEST as well as developing an innovative, agile and co-operative industrial framework to deliver TEMPEST".

The agreement was the result of a joint Government feasibility study, which was launched following publication of the UK's Combat Air Strategy at Farnborough Air Show in July 2018. The study concluded that the "UK and Italy are natural Combat Air partners, with both Air Forces operating the same, potent fleet of Eurofighter TYPHOON and F-35".

The SOI will see the parties develop a partnership model which will include knowledge sharing, product definition and technology development for the joint development of future combat air systems. Charles Woodburn, Group Chief Executive Officer, BAE Systems, speaking at DSEI on behalf of the leading UK defence companies, said, "Our proven record of successful collaboration with Italian industry makes us certain that this partnership between our

two nations is a strong fit for TEMPEST and demonstrates the growing momentum behind this important international endeavor. Today's announcement will expand existing partnerships with MBDA and Leonardo".

TEOR air-to-air missile," said Pasquale di Bartolomeo, Managing Director of MBDA Italia.

Elettronica, Italy's champion in Electronic Warfare, already works closely alongside Leonardo-UK, this country's



Flexible, connected and cooperative – the concept layout of the TEMPEST

Alessandro Profumo, CEO of Leonardo, added: "I am very pleased that Italy has taken the decision to join TEMPEST at this important stage in the programme, which is great news for Italian industry and the future prosperity of our nation". Similarly, MBDA is a fully integrated enterprise with important activities in both Britain and Italy. The METEOR system is just one example of cutting-edge technology which is collaboratively designed and provided to the Air Forces of both nations. "Today's announcement further reinforces MBDA's contribution to TEMPEST programme, exploiting the industrial excellences offered by the nations involved. In addition to its future weapons capabilities presented by the TEMPEST Team during the show, MBDA Italia will be able to contribute with its system expertise developed thanks to the ten-year participation in multinational programmes, such as the ME-

leading supplier of airborne electronics and electronic warfare. Though natural competitors, the two companies are working together on the Praetorian Defensive Aids Suite for the Eurofighter TYPHOON.

In July 2018, the UK and Sweden had signed a Memorandum of Understanding (MoU) on future combat air, committing the parties to work on a joint combat air development programme. The Statement of Intent (SIO) signed between the UK and Italy MoD and industries is an attenuated commitment to the programme. "The launch of this important partnership between Italy and the United Kingdom, in a strategic sector such as aerospace, is a very positive result", the new Defence Minister Lorenzo Guerini said. According to Guerini, this agreement is "yet another confirmation of the excellence of the Italian defence industry." ■

Spain Needs New Trainer Aircraft

Esteban Villarejo

The Spanish Government has issued a call for tenders to buy 24 jets and 4 simulators.

The US-made Beechcraft T-6C TEXAN II is the favourite.

The Spanish Air Force needs another trainer plane. In 2021, the CASA C-101 AVIOJET will reach the end of its service life, and for this reason the Spanish government has issued a call for tenders for the purchase of a new model. In April 2019, the Government approved a budget of €225M for this acquisition. In total, there will be an additional €75M per year in 2020, 2021 and 2022, the date by which the replacement of the C-101 is expected to be completed.

"The Air Force has determined that the date on which the current C-101 system will not be able to continue providing basic training for Air Force students is September 2021. A new system with the technological capabilities that guarantee

adequate training should be available by that time", an MoD official told ESD.

The replacement of these 60 C-101 aircraft is one of the priorities of the Spanish Air Force in the coming years. The veteran C-101 entered into service in 1980. This type is an advanced training aircraft that allows a complete aeronautical formation from the first flight phases until the transition to the fighter planes. It was built entirely in Spain by Construcciones Aeronáuticas S.A. (CASA), which later became part of Airbus. The C-101 is also the plane used by the "Patrulla Águila", the aerobatic demonstration team with seven aircraft. Therefore, the new model will also replace this symbol of the Spanish Air Force.

According to official sources, the €225M contract is for the acquisition of 24 aircraft, 2 flight training simulators, 2 operational flight simulators, and 1 ejection seat trainer. "Nowadays, there is a 50-50 proportion between the hours of training in flights and simulators", the MoD underlines. The tender documents stipulate that the company that finally wins the contract will train eight pilots.

A Tender Favouring "Made in USA"

The Spanish procurement authority DGAM is receiving possible options until 23 September. So it is still a secret which companies compete for the tender but there is an obvious favourite: the "made in USA" Beechcraft T-6C TEXAN II manufactured by Textron Aviation Defence, a turboprop aircraft that has already been evaluated by Spanish Air Force.

"The Beechcraft T-6C is a next-generation military trainer designed for all levels of instruction – from ab initio to advance operational training. The T-6C TEXAN II was purpose-built for a wide range of training capabilities, long-term reliability and cost-effective operations", the US company presents.

Its low operational cost, the advanced Esterline CMC Cockpit 4000 avionics suite, and the turboprop engine Pratt & Whitney PT6A 68 are the main characteristics that make the T-6 TEXAN II the preferred option for the Spanish Air Force. The T-6 TEXAN II is operated by the Luftwaffe, Mexico, Argentina, Canada, and US Air Force and Navy, among other clients.

The Swiss Option: PC-21

Another preferred and evaluated tender is the Swiss PC-21 (Pilatus Aircraft). "The PC-21 has better aerodynamic performance than any other turboprop trainer on the market, pushing the speed and climb rate into a domain previously reserved for jets only", the Swiss company defends.

Photo: EJÉRCITO DEL AIRE



C-101 AVIOJET aircraft during a flight from the Air Force Academy in San Javier (Murcia)

Photo: EJÉRCITO DEL AIRE



In 2021, the C-101 AVIOJET will reach the end of its service life.

Its cockpit avionics with the display and control system can emulate latest generation front-line aircraft. Fuel consumption and associated costs are also the advantages of this type of trainer.

"Pilatus has also developed a fully integrated training system to accompany the PC-21. It comprises the latest simulators, computer-based training and pilot classroom instruction. Nine customers have bought 211 PC-21s since its maiden flight in 2002", a company spokesperson said. France, Jordan, Australia, Qatar, Saudi Arabia, United Arab Emirates, Singapore and Switzerland are among the clients of this trainer aircraft.

Among the requirements put forth by the Spanish Air Force, the new trainer should accomplish: a maximum speed between 370-425 km/h at an altitude of 7,600 metres and with half a tank; a flight between 7,600 and 9,150 metres; an autonomy between an hour and a half and 2 hours at a speed of between 370-425 km/h; an on-board oxygen system; and the company that offers a smoke system for aerobatic displays will receive more points.

The trainer aircraft that has been awarded the contract will be part of a sophisticated integrated training system for the General Academy of the Spanish Air Force in San Javier (Murcia).

Another Spanish Option Required by 2027

Apart from this first acquisition (Beechcraft T-6C TEXAN II or Pilatus PC-21), another type of jet will be required by 2027 to complete the new training concept: the 50 Spanish F-5 fighters that instruct the military pilots in the combat flight and the 40 smaller T-35C Pillán (first flights) will also have to be replaced.

In an interview with journalists, the head of the Spanish Air Force, General Javier Salto, defended the choice of a Spanish industry aircraft for this second aircraft procurement programme because "it creates jobs directly in Spain". And the answer to this requirement is Airbus, the European manufacturer with factories in Getafe (Madrid) and Seville. "We are working to make that project real", sources at Airbus told ESD.

Airbus is leading an alliance with the Spanish companies Indra, ITP, GMV, Tecnobit or Cesa (controlled by the Canadian company Héroux-Devtek) to reach that objective and present an offer to the Air Force. All of these companies are now designing the "made in Spain" aircraft called Airbus Flexible Jet (AFJ) that



Photo: EJÉRCITO DEL AIRE

The C-101 is also the plane of the Spanish aerobatics team "Patrulla Águila"



Photo: Textron Aviation Defence

The turboprop Beechcraft T-6 TEXAN II



Photo: Pilatus Aircraft Ltd

The Swiss PC21

would cover all military training needs and would be interconnected with the A400M, the EUROFIGHTER and its future substitute, the Future Combat Air System (FCAS).

"It is a great opportunity for the Spanish industry in simulators, sensors, equipment. We are going to make all of the avionics; the propulsion systems will be also specific and new for this model. It

will be a last generation aircraft. It will be a strong step to maintain the capabilities in Spain: design, build, certify and maintain a complete aircraft. This is something that only a few countries can do", sources at Airbus told ESD.

The new model would also be an export opportunity for Spain that would join to the C-295, A330 MRTT and A400M aircraft. ■

Containers for a Multitude of Applications

Gerhard Heiming

Sixty years after the introduction of containers, two thirds of the international trade in goods is carried out with standardised metal boxes. The separation of transport and handling of cargo has quickly led to the development of functional containers that can provide mobile capabilities.

A container is quickly described in terms of length, width, height and maximum weight and geometrically determined by the distances between the twist lock fastenings at all eight corners. While 40' containers predominate in world trade (mainly sea trade), functional containers are mainly designed in size 20'. With a width of 2,438 mm and a height of 2,591 mm, the 20' ISO standard containers can be transported on normal roads. With a length of 6,058 mm and a weight limit of 24 tonnes, standard

Separation of Transport and Function

In addition to intermodal transport, the use of containers makes it possible to separate means of transport and function. To do this, the container must be set down from the transport vehicle. Some lorries, such as the Bundeswehr's MULTI A4 swap body truck, have devices for depositing containers. In 2018, Rheinmetall and Supashock presented

mission-specific equipment by system companies. By using multiple containers, in which the surface area can almost be doubled or tripled by means of sliding mechanisms, or by coupling containers, the working area that can be used without partition walls can be enlarged within wide limits. For users, modularity, mobility and protection are important aspects that are largely independent of missions.

Container Superstructure

The main task for the container is to provide a defined and protected interior. The minimum requirement for the walls, ceiling, floor, doors and windows is therefore tightness against water and dust during loading, transport and stationary operation. The walls are given stability by beads that characterise the appearance of the container. All-round thermal insulation is required for operation at high and low temperatures. Depending on the temperature spectrum and work requirements, the internal temperature must be maintained within the required range by cooling or air-conditioning equipment. For armed forces in operation, protection against the threat of fire or explosives is often required.

While on the outside threats and harsh conditions are to be prevented, the walls on the inside are the carriers of the equipment. Standardised mounting rails are mainly used for the secure placement of the interior fittings or transport goods and their fastening (including transport securing). The elements to be accommodated are delivered as finished modules and assembled in a few simple steps according to the assembly plan. In addition, rail systems make it possible to quickly change the inner workings depending on the mission requirements.

Against the background of these numerous requirements, the outer skin of the container becomes a complex structure that must be laid out within the weight limits of the container.



Photo: Drehkammer

A field camp may comprise a multitude of different containers.

lorries are suitable as means of transport. With their standardised dimensions, containers determine intermodal transport. All modes of transport (ship, rail, air and truck) have twist locks and can accommodate containers. In intermodal transport, for example, the cheapest means of transport can be selected. Ships (inexpensive) and aircraft (fast) are suitable for (strategic) long-distance transport. On the long and medium haul ashore, an extensive railway network is available, especially in Europe. Only lorries are suitable for (tactical) transport to the final destination - even off the beaten track. Modern military logistics lorries and trailers are equipped with container support frames for this purpose.

an Automated Load Handling System (ALHS) for trucks, with which containers can be safely set down or picked up by one person even under off-road conditions (for example, dirt, inclines of terrain and vehicle). Otherwise, either an appropriate infrastructure is required, or the presence of industrial lorries especially laid out for handling containers. In special cases, containers are equipped with hydraulic supports with which the individual (or coupled) container is lifted from the vehicle chassis at the point of use and lowered to working height after the vehicle has moved away. Functional containers are built by specialist companies and are fitted out with



Photo: KMW

German MuConPers protected transport container for 18 troops

Protected Containers

Containers used for military applications are exposed to the threat of hostile forces. In particular, personnel - but also important facilities such as command posts and mission-critical equipment - must be pro-

met if containers are coupled in groups, as is the rule in field camps with residential and office containers. This is no problem for blast and ballistic protection. For radiation protection and NBC protection, the connections to corridors or connecting wings must also be "sealed". For NBC

tions, residential and office containers can be used to quickly erect accommodation and workplaces in room-cell construction for larger numbers of people. The high demand measured in units is covered by a large number of suppliers. In Germany alone, Procontain, CHS-Container and Losberger, among others, are active in this field - in addition to Drehtainer, as mentioned above. The containers can be delivered with removable walls. Then it is possible to flexibly produce rooms of different sizes on site. Doors and windows (on the outer walls) are standard equipment, as is the electrical installation, including network cabling and lighting. After the mechanical construction with up to three floors, only the electrical connections must be made, and the container is ready for operation.

The interior furnishing with the homely design of the walls and the furniture forms a separate trade.

The flexible and at the same time robust construction predestines the containers for the construction and operation of emergency infrastructure for fast and highly mobile use worldwide.



Photo: Drehtainer

Containers also provide protection for transportation of battlefield casualties.

tected from access and fire from weapons of all kinds. The protection requirements relate to ballistic protection, protection against blast, radiation safety/HF shielding and NBC protection.

The company Drehtainer, for example, has already delivered a large number of containers, the protection of which is certified according to the NATO STANAG 2280 (for infrastructure) and STANAG 4569 (for vehicles and superstructures) standards. Such containers can also protect personnel against direct hits with 107mm or 122mm rockets. The protection requirements must also be

protection, a protective ventilation system is required in addition to the seal, which provides filtered breathing air with positive pressure. Access must be structurally controlled through a sluice, which prevents any contamination.

Residential and Office Containers

Among the most frequently used functional containers are residential containers, which are also used extensively in civilian environments. After preparing the founda-

Field Camp

For the accommodation of troops in the theatres of operation, stationary field camps are set up due to the lack of available infrastructure. They are the basis for all activities and at the same time a safe retreat for the forces deployed. For tasks such as operations planning (headquarters), repairs and even airports, accommodation for high performance work on a permanent basis must be provided. While tents are mainly used for short-term accommodation, containers are used for medium-term periods (one to two years).

The Bundeswehr is currently planning to procure ten container-based, protected field camp modules with accommodation capacities of 500 persons each. The containers - either in combination or individually assembled - are equipped with the relevant specialist technology. The integrated ballistic protection in accordance with resistance class C4 (STANAG 2280) is intended to prevent the fragmentation and blowing effect of projectiles that fall at close range.

The more than a dozen modules listed require performance from almost all trades of real estate operation. Individual building blocks such as energy supply or field camp operation use complex technology and affect all other building blocks. Therefore, the modular field camp system requires effective, comprehensive coordination in development and production.

Photo: Marshall



Expandable container for the Dutch DVOW programme

Photo: Thielmann WEW



The 8,000L fuel container system from Thielmann WEW is designed to provide an autonomous, mobile, deployable system able to dispense diesel or kerosene directly into vehicles or other containers.

Tank Containers

The supply of bulk consumer goods such as fuel or drinking water (if not produced locally) to the end consumer is almost exclusively carried out with tank containers. Specialists such as Gocher Fahrzeugbau GOFA and Thielmann WEW have designed and built complete solutions within ISO container dimensions. The focus is on the tank container, which must meet high safety requirements and in some versions is also hardened to withstand fire. Pump and distribution systems are of importance for practical applications, which - in compliance with safety regulations - can make it possible, for example, to set up a field filling station.

Special Applications

Modular Medical Facilities

Medical support is one of the core tasks during missions. In order to be able to

quickly implement the high-quality standards comparable to hospitals, container solutions designed for assembly configurations on site, from the rescue station to the emergency hospital, are used. This ensures initial and continued medical care under operating conditions. The components selected according to requirements are transported to the site of operation in intermodal transport (including air transport) and can be used in the shortest possible time.

The German Navy's naval rescue centre (MERZ) consists of 26 containers, which are fully equipped on land and installed on the upper deck of a task force supply ship. This means that a medical service capacity, which can also be reached by helicopter, can be provided worldwide.

Passenger Transport

The Bundeswehr has procured a crew transport container (MULTI-capable, protected container for passenger transport,

MuConPers) for the protected transport of persons outside secured field camps. The container has been given a highly protected structure against asymmetric threats such as booby traps and fire and offers 18 seats for emergency personnel including their equipment. A MULTI (see below) serves as a means of transport, which can pick up and set down the MuConPers without external assistance. Drehtainer has developed a protected casualty transport container (GVTC), in which wounded persons can be transported between medical facilities or home accompanied by two paramedics. Depending on the configuration, the GVTC can accommodate four persons seated and four lying or six persons lying. The persons are protected against ballistics and blast as well as against NBC attacks. The GVTC has been tested by the Bundeswehr and is ready for series production. A delivery order has not yet been placed.

Work Stations in Coupled Containers

In order to quickly create a work infrastructure (e.g. medical equipment, command post, checkpoint, etc.) without external help, Drehtainer has developed a system for the attached coupling of containers. A special sliding frame is implemented between the carrier vehicle and the container, which can compensate for uneven terrain, height differences and vehicle spacing. As soon as the trucks with loaded containers have reached their positions, the containers are moved with the sliding frame in such a way that they are connected to each other using the coupling principle proven in field camp construction. This creates spaces from several containers which can be hydraulically separated from the carrier vehicles and brought to the desired height. Design (e.g. protected) or equipment depend on military requirements.

Workshop Equipment

BwFuhrparkService is the mobility service provider of the Bundeswehr and provides vehicles in full service. This includes maintenance and repair in operation. If - e.g. abroad - it is not possible to fall back on authorised workshops, BwFuhrparkService provides workshop equipment in containers (WSA). The - previously trained - Bundeswehr personnel will find the necessary special tools and a basic set of spare parts (including tyres) necessary for daily operation. The container solution makes it possible to follow the troops to a certain extent and to be positioned correctly.

Container System

The Netherlands have recently launched a comprehensive containerisation programme as part of the military renewal of tactical vehicles (Defensiebrede Vervanging Operationele Wielvoertuigen, DVOW). Until 2024 Marshal ADG will deliver 1,400 ISO 20' containers. The containers are equipped in variants for the tasks of management, communication, maintenance and goods storage. Most containers have air conditioning and are protected against harmful external radiation. Containers for command and control applications can be extended to a working area of 36 m².

Marshal is also responsible for the maintenance of the containers in operation. The containers are equipped with a Track and Trace system and a Health and Usage System (HUMS). The system will be activated when the first maintenance containers are delivered in February 2020.

This enables users to track, control and monitor a range of functions. These include performance and use of subsystems, including heating, ventilation and air conditioning, humidification, dehumidification, generators, CBRN, various tank sensors, alarms and maintenance conditions.

The operator, Marshall, can thus plan and control the movement and availability of the container systems for the Dutch military in order to achieve optimum availability.

Carrier Vehicles

More and more lorries are gaining ground in the armed forces, which are, for example, equipped with supporting frames for transporting containers. Palletised Loading Systems (PLS) or Demountable Rack Offload and Pickup Systems (DROPS) are equipped

Modular Tanks for Fuel Farms

Western Global is a UK-based manufacturer of fuel tanks and bowsers. In 1962, Western Global was established as a family business in Stoke Gifford, UK as a tank fitting outfit. From its humble beginnings, Western expanded from the UK into European and North American markets. In 2014, Western acquired the business of TransTank Pty Ltd, bolstering its containerised tank capability and expanding its footprint into Australia and South Africa. As a provider of portable tanks and dispensing equipment for the storage and handling of fuels, lubricants and other fluids, Western Global is certified according to ISO 9001:2015; 14001:2015 BSOHSAS 18001:2007, and it has local and global product approvals including United Nations (UN), Underwriters Laboratory (UL & ULC), KIWA (Netherlands), British Standards (BS) and Australian Standards (AS).

Meanwhile, Western Global operates fabrication and assembly facilities in Australia, Africa, Europe and North America. Its most successful product is the TRANSTANK PRO – a stationary bulk fuel container for heavy-duty, on-demand fuel supply applications. TRANSTANK PRO offers effortless connectivity and a reduced storage footprint and has a capacity ranging from 12,200 litres to 89,400 litres. The containers can be linked together to create an effective fuel farm. With their modular design, the tanks can provide unlimited storage capacity, ideal for large scale power projects and refuelling. Storable fuel types include Diesel, Gasoline, Aviation and JP8. Plus, the double-walled design eliminates the need for secondary containments. The units can be relocated easily, as they are built to ISO container dimensions. Available in 10ft, 20ft, 40ft.



Photo: Western Global

to pick up and set down containers with their own means. The lorry must be able to carry at least 15 tons of military payload to accommodate a 20' ISO container.

The MULTI A4 FSA, which is in service with the Bundeswehr, has both a hook with which so-called roll-off containers can be lowered and an X-frame for lowering containers. The carrier vehicle is a SX45 truck from Rheinmetall MAN Military Vehicles with a protected cabin.

The new all-round transporter, the unprotected militarised transport vehicle (UTF mil), is also equipped with a container support frame and can transport 20' ISO containers in the 8x8 version.

For more than twenty years, the US

armed forces have been using PLS trucks from Oshkosh, which can carry a payload of 15 tons on a 10x10 chassis and carry its own handling unit.

Containers on the Advance

This small and certainly not complete insight into the use of containers by the armed forces shows a considerable potential for the increase in capabilities using containers. Rapid strategic and tactical deployability enables a rapid shift of focus. The personnel deployed find optimal working conditions - if necessary, under protection - and do not have to do without sensitive electronic equipment. ■

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Training and Simulation Update

William Carter

This year's European International Training Equipment Conference (ITEC) was held in Stockholm with the theme "Interoperability – Connecting People, Technology and Nations".

The Keynote Speaker was Major General Karl Engelbrektson, Swedish Army Chief of Staff, who noted that two panel members were from the civil area and that both military and civil authorities are involved in crisis management and it is essential that they operate together. Continuing the theme of military/civil interaction, Rear Admiral Simon Williams of ITEC organisers Clarion Defence noted that many civil personnel were attending the conference. Other members of the Keynote Panel were Dr Frank DiGiovanni, US Navy Warfare Division; Hans Lindgren, Saab Training & Simulation, and the two civilians were Dan Eliasson, Swedish Civil Contingencies Agency, and Dr Raed Arafat, Head of Romania's Department of Emergency Situations.

On numbers attending, the ITEC web site says that there were "more than 2,000 attendees from 45 countries". This is the lowest number of ITEC attendees for many years. A survey on ITEC by the European Training and Simulation Association (ETSA) showed that 67% of responders thought that the exhibition was not as good as previous years, and its size may have become less than the "critical mass" for such an international event. Key companies not attending included Airbus training, Barco, Boeing training, L-3 Technologies, Meggitt, QinetiQ, Rheinmetall and RUAG. Responders also expressed a preference for the event to be held in London. This will happen next year at the Excel exhibition centre near London City Airport from 28 to 30 April 2020, preceded on 27 April by the usual seminar of the Simulation Interoperability Standards Organization (SISO), currently planned at the Royal Aeronautical Society headquarters in central London. ITEC has a tradition of moving from place to place rather than staying at one venue like its much larger American counterpart that stabilised in Orlando many years ago and quickly increased in size. It might be better to stabilise future ITECs at one or two popular venues, such as London, Cologne, or perhaps Stuttgart where the conference centre is in the airport complex itself and no extra travel is needed if you stay at one of the many hotels near the airport.

Photo: via author



BAE SYSTEMS' SCEPTRE system

Recent Projects

In the review below, in addition to conventional training devices, there is a portable containerised system, mixed reality systems that combine real and synthetic worlds, a VR headset that can be used in the field, an Air Control trainer, a hypoxia (lack of oxygen) trainer based on an aircraft cockpit, a trainer for cyber events, and training devices for UAVs. Countries receiving new training devices include Argentina, Bangladesh, Latvia, Qatar, and the UAE, showing increased world awareness of the cost-effectiveness of modern simulation and training technology.

Fixed Wing Aircraft

Argentina: TRU Simulation + Training, headquartered in Charleston, South Carolina, is to deliver an operational flight trainer (OFT) for the Beechcraft T-6 TEXAN II turboprop trainer for the Argentine Air Force. It will have a visual display from Redifun Simulation with 270 by 80 degree view in a 10-foot radius dome.

Qatar: Boeing Defense Training Systems and Services, headquartered in St. Louis, has a US\$500M contract for F-15QA aircrew and maintenance training for the Qatar Emiri Air Force for completion in 2026.

Spain: Indra Sistemas, headquartered in Madrid and the iAltitude company have supplied a new type of hypoxia flight trainer to the Spanish Air Force Aviation Medicine Training Center in Madrid. This models the cockpit of a C101 jet trainer and enables a realistic mission to be simulated including hypoxia incidents and how to deal with them. Previously, hypoxia was trained in a so-called "hypobaric" chamber in which atmospheric pressure can be reduced, but without a realistic cockpit environment. In the new Indra cockpit model, the atmospheric pressure is normal but different ratios of oxygen and nitrogen are supplied through the pilot's face mask. This allows controlled symptoms of hypoxia to be experienced in a realistic cockpit environment.

UAE: SoftekSim of Riga, Latvia, is to supply a Flight and Navigation Procedures Trainer (FNPTI) for Multi Crew Coordination (MCC) to Fujairah Aviation Academy in Oman. Fujairah trains pilots and engineers including for flying using Night Vision Goggles (NVG).

UK: Thales UK and UK training aircraft manufacturer Aeralis are to develop training systems for the UK TEMPEST future fighter programme. This includes simulator systems for basic training through to lead-in fighter training, courseware, data on student performance and aircraft utilisation.



Photo: CAE

CAE has upgraded the UAE Presidential Guard's Joint Fires Training Simulator (JFTS) with the latest version of MetaVR's Virtual Reality Scene Generator.

UK: BAE Systems is to deliver the SCEPTRE computerised mission planning system for Royal Air Force TYPHOON fighters. SCEPTRE combines cockpit views, flight and performance data, potential hazards and conflict detection, real time weather, intelligence, and other data. It is for mission rehearsal and can be used on tablets, computers and interactive touch tables such as those used for briefing and de-briefing.

Rotary Wing

Australia: Thales Australia has achieved Initial Operating Capability (IOC) for their Helicopter Aircrew Training System (HATS) for the

Australia Defence Force (ADF). Thales has delivered three Level B Reality H Full Flight Simulators; trainers for rear-crew; part task trainers and classrooms with desktop trainers, plus devices for the Joint Helicopter School.

Bahrain, Saudi Arabia, UAE: Collins Aerospace Simulation & Training Solutions has a US\$30.95M contract for a Transportable BLACK HAWK Operations Simulator (T-BOS) for the National Guard of Saudi Arabia. Other customers include Bahrain and the UAE. T-BOS is containerised and can be deployed to Forward Operating Bases (FOB).

Greece: Pinnacle Solutions is to maintain OH-58D KIOWA helicopters and Training Aids, Devices, Simulators and Simulations (TADSS)

for the Hellenic Army Aviation Command. **UK:** Inzpire Ltd. has upgraded its Targeted Fidelity Simulator (TFS) with higher fidelity instruments and displays. It models an EC135 helicopter and uses Bohemia Interactive Simulations software. Rear cabin crew use VR headsets with 360-degree view for weapon and winch operator training.

USA: CAE USA of Tampa, Florida and Leonardo Helicopter Division, headquartered in Rome have signed a Memorandum of Agreement (MoA) to collaborate in helicopter training packages in the USA and for Foreign Military Sales (FMS). The companies will provide aircraft and training centres including simulators, other training devices, and courseware.

Air Control System

UK: QuantaDyn Corporation is to upgrade the UK version of its QFires Joint Fires Mobile Trainer (JFMT) with VBS Blue IG by Bohemia Interactive Simulations (BISim). The JFMT is a self-contained mobile classroom to train JTACs, FACs, and JFOs, produced under the Close Air Simulation and Support System (CAS&S) contract with Elbit Systems as prime contractor. QuantaDyn provides the trailer-based training system and Elbit UK provides training and logistics. A four-person brief

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area has a large screen display and the main trainer has a 1.8m diameter dome with 220 x 58-degree view.

UAVs

UK: The Top Cover Solutions (TCS) Consortium is to provide simulator support for the Royal Air Force MQ-9 REAPER UAV. TCS includes 3SDL and Eagle Eye Innovations. It will interact with the MALET-JSIL Aircrew Trainer (MJAT) based at RAF Waddington, UK, and the RAF's 39 Squadron at Creech Air Force Base (USA).

Cyber Systems

Spain: Indra Sistemas, headquartered in Madrid, has supplied its Cyber Range system to the Joint Cyber-Defence Command of the Spanish Army.

Land Systems

Austria: Calytrix Technologies is to supply its TITAN real-world terrain modelling system to the Austrian Army. TITAN will be used in school houses and have combined arms capabilities with its integration with eSim Games Steel Beasts.

Bangladesh: MASA Group, headquartered in Paris, has a contract with the Bangladesh Army for its MASA SWORD war gaming system at the Bangladesh Army War Game Center (AWGC). AWGC uses SWORD for command post training from Battalion to Division levels.

Finland: Saab has a €9M contract to supply simulators for marksmanship and combat training to the Finnish Defence Forces Logistics Command. This will include Saab's Ground Combat Indoor Trainer (GC IDT) system.

Germany: Systematic A/S has supplied the German Army with an e-learning programme for the SITAWARE training product for army HQ staff.

Photo: via author



Kongsberg's Rigid Inflatable Boat Gun Simulator

Germany – US Army: Raytheon has a US\$159M contract to support training exercises at the US Army Joint Multinational Readiness Center (JMRC) in Hohenfels and other US forces in Europe. This includes the Raytheon Mobile Instrumentation System for distributed training.

Latvia: Cubic Defense Systems has supplied their Multiple Integrated Laser Engagement Simulation system (MILES) to the Latvian Armed Forces in a €2.7M contract. MILES can be attached to military equipment, weapons or vehicles, and records engagement, firing and casualty data. Indo-Pacific Region. Cubic has US\$150M contracts from various customers in the Indo-Pacific (IPAC) region. This is for Air Combat Manoeuvring Instrumentation (ACMI), training support for Combat Training Centres, upgrades and maintenance services for live fire ranges. This includes Cubic's Multiple Integrated Laser Engagement Systems (MILES) and range maintenance.

UAE: Close Air Solutions (CAS) has upgraded the UAE Presidential Guard (PG) Joint Fires Training Simulator (JFTS) with the latest version of MetaVR's Virtual Reality Scene Generator (VRSG). 49 VRSG licenses were renewed

and two new licenses were purchased. The upgrade also includes MACE software from Battlespace Simulations, and a new classroom with a 4-projector 8m display from Immersive Display Solutions. The RG-31 AGRAB 4-wheel vehicle mortar simulator can be used with JFTS so that AGRAB Fire Teams can train with joint forward observers (JFO) and joint terminal attack controllers (JTAC).

Naval Systems

Australia: Kongsberg Digital of Norway is to deliver two K-Sim full mission bridge simulators to the Royal Australian Navy Watson Bridge Simulator Facility in Sydney. Also, ship-handling and engine room simulators will be delivered to training facilities across the country. This includes training for ARAFURA class offshore patrol vessels, the new HUNTER class anti-submarine Future Frigates, and Supply Class Auxiliary Oiler Replenishment (AOR) vessels.

Canada: CAE has a contract from Lockheed Martin Canada in the programme for the future Canadian Surface Combatant (CSC) ship. CAE will provide Training Needs Analysis (TNA), engineering, and other services. The CSC ship design is based on BAE Systems Global Combat Ship and will include the CMS 330 combat management system developed by LM Canada.

Greece: VSTEP B.V. of Rotterdam, Netherlands is to provide three of its NAUTIS Console simulators for the Greek Navy training facility in Piraeus, Athens. They will have three screens with a 120-degree view, and 15 types of vessels will be modelled.

Sweden: CAE is to upgrade the Naval Warfare Training System (NWTS) at the Swedish Naval Warfare Centre (NWC) in Karlskrona. NWTS was originally developed by CAE in 2016 and has 52 student stations and 13 instructor stations. It trains for sensor operations and Command, Control, Communica-

Photo: via author



QuantaDyn's Remotely Piloted Aircraft Simulation System

tions, and Computing (C4). Upgrades include sonar and electronic warfare training, and improved training scenarios. CAE will also add friendly and enemy Computer-Generated Forces (CGF).

UK: QinetiQ Group plc has a contract with the Royal Navy for the POINTER data analysis and measurement system. Developed together with the UK Defence Science and Technology Laboratory (DSTL), also at Farnborough, POINTER links Command and Control functions with weapon operators for training to counter threats from Fast Inshore Attack Craft (FIAC) including swarms of craft. It will be used in exercises on a range of platforms under the Royal Navy Flag Officer Sea Training (FOST). Weapon-mounted laser rangefinders are used, and position and state of weapon systems is recorded together with GPS-tracked threats. Weapon effects are calculated, and results are displayed in real time.

UK: Saab is to supply its AUV62-AT underwater vehicle for anti-submarine warfare (ASW) training to the Royal Navy. USA. Cervus Defence Ltd UK and its US partner Stucan Solutions has a contract for Risk-Reduction Prototyping of the US Marine Corps Wargaming Capability Center. This will include post-game analysis using the STUCAN-HIVE system.

Simulation and Training Systems

Belgium: Barco NV has developed its XT LED system. The LED displays are accessible from the front and have a shallow depth, convenient for wall-mounting. An Assisted Module Extraction feature allows tiles to be removed for maintenance or replacement.

Czech Republic: Bohemia Interactive has introduced the VBS3 Bundle, bringing together VBS Control Behaviour Pack 1, VBS Chalkboard Pro, VBS Radio Pro, and Terrain Pack. This adds features to its VBS3 system, including Artificial Intelligence, behaviours, simulated radio, expanded connectivity, and more content.

Finland: Varjo Technologies of Helsinki has developed the XR-1 headset with imagery and eye-tracking. This adds a front plate to the earlier Varjo VR-1 device that includes two 12 mpx cameras.

France: Antycip Simulation has developed The Open Reality Experience (TORE). This is a 4 x 8 x 8 metre visualisation system on two-floors of a training building, and uses curved screens rather than the flat screens of a cube-shaped Cave Automatic Virtual Environment (CAVE). TORE has been developed for the University of Lille and is

located at the so-called "Imaginarium" in Tourcoing.

Spain: Indra Sistemas has developed a VR headset that can be used by soldiers when training with real equipment. The headset adds a virtual environment and is part of the iVictrix marksmanship simulator, related to some 40Victrix simulators used by the Spanish Army.

Conclusion

This article lists recent training devices supplied to organisations in 19 nations by 28 different suppliers based in 15 countries. Subject areas include land, sea and air equipment, UAVs, multi-role systems, and cyber. It also points out that the 2019 European ITEC exhibition in Sweden has been assessed as less than the "critical mass" for such a potentially major event. Perhaps it could be rescued by changing the ITEC habit of going to a different place each year, and stabilising at one, perhaps two, popular European exhibition locations. See you in 2020 at ITEC in London and later at the really big event, I/ITSEC in Orlando, which anyone with an interest in state-of-the-art cost-effective training and simulation systems, should plan to attend. ■



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CBRN Training and Simulation

Dan Kaszeta

The CBRN defence discipline, and its corresponding CBRN defence industry, are often viewed in terms of equipment and technology. Indeed, this is a segment which confronts technological threats.



Photo: Argon

The British company Argon is the market leader in CBRN training and simulation. Depicted is a French CBRN recce team approaching an exercise site with Argon's AP4C-SIM chemical detector simulator and the SS2 radiological survey meter.

Many of the solutions and countermeasures to the CBRN threat are items of equipment and sophisticated technologies. However, addressing the threat adequately needs things beyond hardware. Doctrine and philosophy play an important role, as do simulation and training. These softer areas of CBRN defence are as valid as the hard equipment areas like protection, detection, and decontamination.

Author

Dan Kaszeta is Managing Director at Strongpoint Security Ltd. and a regular contributor to ESD.

The Training Market Segment

Technology and equipment are still important in training simulation, but few new products have emerged of late. The article that this author wrote on this same subject in 2017 is valid with little or no revision. The overall shape of the marketplace in this sector remains very similar since this magazine addressed the subject two years ago. Argon Electronics (UK) is still very much a leader in this space and provides both hardware and software for realistic simulation of CBRN detection. They produce simulators that look and feel like actual detec-

tors, and their close collaboration with the various major detection manufacturers adds great value to their products. Other players in the market space providing useful hardware and software include Hotzone Solutions (NL), Saab (Sweden), Prometech (NL), Bruhn Newtech (Denmark), and Hazzsim (USA). Hotzone's simulation kit continues to be a useful addition in this market-space. It is a set of chemicals that have the exact same physical characteristics as major chemical warfare agents. This much is not new; Battelle Institute (USA) fielded such a kit in the 1990s. But the Hotzone kit gives results on the major detection hardware identical to the chemical warfare agents they are meant to detect. The effect is stunning, so much so that one must take care when transporting the kit through security screening checkpoints.

It does a disservice to ESD readers if I were to discuss the CBRN training and simulation purely in terms of hardware and software. This is very much a segment where both the activity and the money are concentrated in services. Services, in particular the provision of training is very much the core of this segment and the running of training courses, schools, and institutes very much drives the purchase of training and simulation technology and hardware.

Hotzone Solutions, already mentioned above, is hard at work in the CBRN training arena. They are quite active in the Middle East, having set up a subsidiary operation in United Arab Emirates. Their current UAE course catalogue leans heavily to basic and intermediate radiation protection, and they seem busy, with classes every month. Cubic, the global defence conglomerate, has won a number of CBRN training contracts around the world. Notably, Cubic has recently landed a major contract to support Australian defence forces with CBRN training, an effort that includes some significant threat simulation efforts. Leidos (USA) has several large contracts to provide CBRN simulation

support, particularly for the US Defense Threat Reduction Agency.

One often-overlooked part of this market space are the underlying equipment manufacturers. Most of the manufacturers of protection, decontamination, and detection equipment will provide training to customers on use of their equipment. Anecdotally, this training ranges from the bare minimum to very good, although it often depends on what the customer actually demands and pays for. Certainly, some of the best CBRN instructors in the field, often retired military specialists, work as instructors for equipment manufacturers. Statistics are not freely available, but if one were to make an educated guess, the number of training hours provided by the original equipment manufacturers is a reasonable proportion of the global CBRN training effort. Equipment-based training has its limits. The manufacturer is very good at teaching technicians how to use their detection instrument, but that same manufacturer is not likely to be the best source of instruction as to what to do when the detector alerts the operator.

CBRN Education – Military and Civil

A core component of CBRN training around the world is the professional military education given both to CBRN specialists and the broader rank-and-file of militaries. The CBRN component of general basic military training is often rudimentary or even non-existent in some militaries, but can be as much as a day or two in others. But for military and other CBRN professionals, it is another story altogether. Normally, in-house training for one's own forces would only rate a nominal mention in a magazine such as this. But a crucial factor, and one occasionally overlooked, is the fact that dozens, if not hundreds, of such schools and institutes will take foreign students. Some do this routinely, while others do it on an occasional basis. This is not a new phenomenon. During the decades of the Cold War, the Soviet Union trained numerous CBRN defence (and, given the times, offence) specialists at specialty institutes. Likewise, the US provided similar training to the rest of the world.

There are some fine institutions doing excellent work in this arena. Although military CBRN schools are too numerous to list, there are a number worthy of mention. The US Army CBRN School (formerly US Army Chemical School – this author is an alumnus), in Missouri, has decades of experience training students from other nations. American public sector civilian institutions, such as California's Specialised Training Institute, the Maryland Fire and Rescue Institute, and the FEMA National Fire Academy to name but a few all have trained foreign students in hazardous materials operations, which are valuable to civil-sector CBRN response.

An interesting development has been the advent of civilian training courses in academic settings. In October 2018, the first course of "CBRN security managers" graduated from University of Lodz (Poland), where this new programme is managed by the faculty of biology and environmental protection in cooperation with Polish police and various institutes in Poland and Slovakia. Graduates were not just Poles. Students from eight other EU member states were in the first class of graduates. The University of Rome-Tor

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Vergata (Italy) has, for a number of years now, offered a Master's Degree course in CBRNe, with two levels – a responder level and an advisor's level. Cranfield University (UK) offers a CBRN defence science course.

European Efforts

Europe is replete with institutions that train students on varying levels of CBRN skills. Most of the major European states have a military CBRN centre or school. Winterbourne Gunner is home to the UK's Defence CBRN Centre. Spiez,

was widely fragmented. Several efforts have been made to streamline and rationalise the situation. A European Union Horizon 2020 project has been funded to help the overall CBRN training situation. Project eNOTICE (European Network of CBRN Training Centres) started in late 2017 and is coordinated by Catholic University of Louvain (Belgium) and has 11 other consortium partners across both military and civilian institutions. JCBRN-CoE is a member, as is the CBRN master's programme at University of Rome-Tor Vergata. The eNOTICE project seeks to coordinate with training and joint exer-

The effort is organised into eight regional secretariats – West Africa, Central Asia, Central and East Africa, the Gulf, the Middle East (e.g. Jordan, Iraq, and Lebanon), North Africa and Sahel, South East Asia, and Southern and Eastern Europe. Many, but not all, of the projects undertaken have been involved in training to help partner countries with CBRN situations. One example of a training project is CofE Project 61, which is still ongoing. It seeks to help improve consequence management after CBRN incidents in ten Southeast Asian countries. Project 61 held training in Laos and Singapore this summer and will hold workshops in Vietnam and Cambodia this autumn.

It should be noted that only part of the CBRN CofE projects actually involve delivery of training courses. But most have some spin-off effect in the training arena. Many of the projects have involved improvements to capacity, knowledge, and/or infrastructure to allow the partner nations to conduct better CBRN training. As one example of many, CofE Project 53 helped rebuild and rehabilitate the Afghan National Public Health Institute, to enable biosecurity and biosafety training.

INTERPOL has embarked on some efforts to improve the ability of police in its member states to respond to crimes involving CBRN materials and scenarios. (This author is part of a working group supporting this effort.) The Chemical Analysis Recovery and Sampling (CHARS) project aims to improve the ability of police and security services to recover and handle forensic evidence in CBRN environments, and is aimed to help member states who have not been able to achieve a level of readiness on this subject.



Photo: Hotzone Solutions

The Hotzone Identifier HazCat kit is a set of chemicals that have exactly the same physical characteristics as major chemical warfare agents.

Switzerland is home to ABC-Zentrum, the Swiss military's CBRN school, which also supports civil protection units. NATO has long had a series of CBRN courses at the NATO School in Oberammergau, offering a wide variety of 1 week modules.

The Joint CBRN Centre of Excellence (JCBRNCoE) is located in the Czech Republic and is chartered to provide CBRN training across NATO. Recognising that coalition and joint operations are the status quo in this current age and not just a novelty, this centre seeks to provide a common framework across the NATO member states. It is led by a Czech Colonel, with a Germany deputy and an American chief of staff. 14 NATO member states support the centre. The Centre runs a number of training courses, and is geographically well-suited to access the Czech live chemical warfare agent training facility. The wide variety of CBRN courses in Europe once meant that the overall picture

was widely fragmented. Several efforts have been made to streamline and rationalise the situation. It also includes non-EU members in this effort, promoting access to training courses in Uzbekistan, Serbia, and Ukraine.

Taking Europe to the Rest of the World

Although this is a European publication, there are notable efforts to export European knowledge and expertise to other parts of the world. It is important to mention long-running efforts by the European Union CBRN Centres of Excellence (CBRN CofE) programme. Based on the EU "Instrument for Stability" and dating back to 2010, the EU CBRN CofE programme has executed a wide variety of projects and programmes outside of EU member states. The level of effort has been very large – €250M over a period of ten years. Projects have been undertaken in approximately 60 partner countries.

Fundamental Issues with CBRN Readiness

CBRN training and Simulation suffers from a fundamental philosophical problem in that it is all too often focused on CBRN specialists, who in turn are a small fraction of their respective militaries. An army with a small cadre of good CBRN specialists, but a very poor level of training and readiness in its combat units will not do well on the battlefield in CBRN conditions. Small or even larger units of well-equipped CBRN specialists, while essential for many tasks, are not a substitute for combat forces that can perform their wartime tasks under actual CBRN operating conditions. Likewise, even excellent instructors teaching basic CBRN skills in initial training environments will not help

much if those skills are not kept up with refresher and sustainment training. Two decades of deployments to Afghanistan, Iraq, and various peacekeeping missions have served, more often than not, to reduce CBRN training in favour of more urgent operational needs.

The key to the survival and resilience of manoeuvre and combat support forces in hazardous and contaminated environments is that every person and every system needs to be able to operate in those environments. Initial training, specialist CBRN soldiers trained in professional institutes, and excellent simulator technology are only going to go a short way towards making sure that infantry and armour battalions can work and fight for hours or days in contaminated environments. CBRN training often begins and ends with training in specific CBRN tasks, like donning masks or conducting decontamination tasks. But what about driving vehicles in protective clothing or directing artillery fire? The entire point of CBRN survivability is to fight battles. But all too often, CBRN defence tasks are treated as end unto themselves. This might save lives from direct CBRN attack, but it will not help armies prevail in battle.

It is necessary to conduct warfighting exercises in imaginary hazardous environments in order to gain this level of readiness. Unfortunately, such exercises are often rare. In some militaries, they are practically non-existent. Such an emphasis in training often requires both support and directives from higher headquarters. Sadly, CBRN readiness often competes with other necessities. The effective answer is rarely "have a big CBRN exercise" as an end unto itself, but integrating hours or half of day of operations in CBRN protective posture into an exercise that was already going to happen anyway is a good start to improving defensive posture.

Major Exercises

While they are not a miracle cure, exercises do help. It is clear that militaries and defence ministries around the world take this as a given, and a variety of CBRN exercises have been noted over previous years. The US Army has a long history of integrating CBRN situations and scenarios into its major exercises at the vast National Training Center (Fort Irwin, California) and the Joint Readiness Training Center (Fort Polk, Louisiana). However, the frequency and emphasis of CBRN training in major training deployments has varied greatly over the years as priorities compete.

Photo: Safety Innovation Center



Established in March 2019, the EU research project eNOTICE aims to establish a European network of CBRN training, test and demonstration centres. Depicted is a recent training exercise.

In one of the more promising CBRN training exercises in recent years in a NATO member state, the UK's 40 Commando, Royal Marines executed Operation Toxic Dagger. In early 2018, this three-week exercise saw over 300 Royal Marines exercise in a wide variety of operations, with CBRN tasks and situations integrated into the overall scheme. The Atomic Weapons Establishment and Porton Down, the UK's chemical and biological centre of expertise, supported the exercise. It remains to be seen if further exercises of this magnitude appear in the UK.

NATO plays a large role in CBRN exercises. Operation "Coronat Mask 18" was led by the Germans and hosted in Bruchsal, Germany in September 2018. It included 1300 personnel from 14 allied nations. "Toxic Valley" is a series of annual exercises habitually hosted by Slovakia, with much participation from other nations. "Precise Response" is yet another annual set of NATO exercises, hosted by Canada at DRDC Suffield, in Alberta.

CBRN training is sometimes seen as an "army only" phenomenon. However, persistent chemical warfare agents can be used to contaminate airfields. As such, CBRN training for air forces is very important, given the vulnerabilities of the necessary support infrastructure. JC-BRNCoE seeks to address this issue by holding an annual series of CBRN exercises at air bases called "Toxic Trip." This

exercise series visits a different air base in a NATO member state each year. Toxic Trip 2019 is being hosted in Italy.

CBRN exercises do occur outside of the European space, although often they get less notice. Japan and South Korea, no doubt cognisant of potential threats from North Korea, conduct CBRN defence exercises. South Korea sent military units to a CBRN exercise called "Atropian Phoenix" in the USA in 2014 and has a reasonable calendar of domestic training. In August 2018, US Army and Japanese Ground Self Defence Forces conducted joint CBRN training at Camp Zama, a US base. In April, 2018, the Jordanian military conducted a major CBRN defence exercise. In early August of this year, over 2000 Russian CBRN specialists and support troops conducted a large CBRN exercise at Tsugol training range in Russia's Trans-Baikal region.

Conclusion

Training and simulation, while not necessarily the most popular of all subjects, requires care and attention. It competes with many other requirements and priorities, but neglect in this area could cause casualties in future conflicts. All of the CBRN hardware in the world is not going to make militaries or civil responders ready to respond to CBRN threats. Training is not a luxury, but a necessity. ■

Protecting Critical Infrastructure

Tim Guest

In the face of danger from multiple threats in today’s uncertain geopolitical morass, protecting critical infrastructure is one of the highest-priority security issues for most governments.

Defining what constitutes Critical infrastructure (CI), also referred to in the UK as Critical National Infrastructure (CNI), follows pretty much the same approach across the globe, though with some variations. The designation CI typically relates to facilities, sites, installations, networks, information, and procedures on which a nation’s population depends for day-to-day life and essential services. Interpol describes CI as acting ‘as the life-support system of our everyday existence’, although the caveat is that some CI sites may actually be non-critical to everyday living, but are still critical because they need protecting to avoid danger to the population. Such might include

chemical plants, nuclear reprocessing plants and others.

This article takes a brief look at what typically constitutes CI. It cites the kind of governmental organisations responsible for and involved with protecting CI, citing certain national and international examples, and then looks at a few specific areas of CI protection, namely: physical access control, surveillance and physical barrier protection.

Critical Infrastructure and its Guardians

The UK Government’s official definition of CNI is “Those critical elements of infrastruc-

services – including those services whose integrity, if compromised, could result in significant loss of life, or casualties – taking into account significant economic, or social impacts; and/or,

b) Significant impact on national security, national defence, or the functioning of the state.”

In the UK, the Centre for the Protection of National Infrastructure (CPNI) is the government authority responsible for delivering protective security advice to the nation’s national infrastructure. It includes the following 12 national sectors on its CI list:

Chemicals	Food
Civil Nuclear	Government
Communications	
Defence	Health
Emergency Services	Space
Energy	Transport
Finance	Water

These are further sub-divided, if necessary, for example, the emergency services are split into Ambulance, Coast Guard, Fire Services and Police. Each CNI sector has at least one Lead Government Department (LGD) looking after it and making sure critical assets have protective security in place, though under the collective umbrella of the CPNI. The CPNI itself is accountable to the Director General of MI5, the UK’s domestic counter-intelligence and security agency, and protects national security by helping to reduce the vulnerability of national infrastructure to terrorism and other threats by providing advice and assistance to those with direct responsibility for protecting physical CNI from such security threats. When it comes to the protection of CNI IT networks, data and related systems from cyber-attack, responsibility for this falls to the UK’s relatively new National Cyber Security Centre (NCSC), which launched in October 2016. It works in partnership with the CPNI to deliver comprehensive advice on all aspects of protective security.



Photo: Axis Communications

The new AXIS Q1798-LE Network Camera. Surveillance cameras combined with powerful analytics can allow operators at CI sites, such as major transport links, to determine the further intelligence required after an initial alarm to assess if action is needed.

Author

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ture (namely assets, facilities, systems, networks or processes and the essential workers that operate and facilitate them), the loss or compromise of which could result in:

a) Major detrimental impact on the availability, integrity, or delivery of essential

For comparison, in the US, the Department of Homeland Security (DHS) is responsible for CI advice/directives across the nation. Its Presidential Policy Directive 21 (PPD-21): Critical Infrastructure Security and Resilience, lays down a national policy to “strengthen and maintain secure, functioning, and resilient critical infrastructure”; on the DHS list are 16 CI sectors:

- Chemical
- Commercial facilities
- Communications
- Critical manufacturing
- Dams
- Defence industrial base
- Emergency services
- Energy
- Financial services
- Food and agriculture
- Government facilities
- Healthcare and public health
- Information technology
- Nuclear reactors, materials and waste
- Transportation systems
- Water and wastewater systems.

As a collective, NATO also has CI protection high on its agenda. At the end of last year, officials and experts from across the Alliance, as well as from part-



Photo: ATG

Retractable bollards like these from ATG have become widely used to protect utilities and other critical infrastructure, airports and datacentres.

ner countries, met at NATO HQ to discuss CI interdependencies across what it terms ‘NATO’s seven resilience base-lines’. These are listed as:

- Energy
- Communications
- Food and water
- Transportation
- Mass casualties
- Population movements
- Continuity of government services.

NATO’s Critical Infrastructure Protection (CIP) efforts focus on establishing a shared awareness and understanding about the potential cascading impact of the degradation or failure of these critical resilience sectors. The meeting in December 2018 brought together more than 230 government representatives, civil servants and civil preparedness experts from allied countries and interoperability partner countries, as well as representatives from the Europe-

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The Locken company provides first line access control for the electricity supply facilities and infrastructure of UK Power Networks (UKPN).

an Commission, academia and industry. It was one of several such meetings that form part of NATO's overall efforts to improve civil preparedness against a range of threats to its allied states and populations, by implementing the "Resilience Commitment" agreed by NATO heads of state and government at the NATO Summit in Warsaw in 2016. Dr. John Manza, NATO's Assistant Secretary General for Operations, said at the time that resilience is now the Alliance's core business, critical for NATO's deterrence and defence posture and critical for the stability of its partners. He said resilience is an essential first line of defence against a broad range of threats. Since the Alliance's inception, CIP has been high on its list of priorities. In the Cold War, pro-

tecting CI was a part of overall collective defence strategies, but this approach has now evolved as new asymmetric threats complicate the picture, particularly as computerisation involvement in so many CI scenarios means cyber threats are pervasive and changing all the time. NATO has, therefore, made it part of its mission to develop a deep and sophisticated understanding of today's asymmetric, hybrid threats, together with expertise in recognising and countering those threats, particularly from cyberspace. It is, however, an expertise and understanding that is having to grow and evolve all the time to keep pace with this increasingly complex, fast-moving, ever-changing and dangerous area.



Locken is using the LPCB4 electronic high-security padlock, which allows only registered, authorised personnel to access work locations.

At a further strategic level, the United Nations (UN) is also on the ball when it comes to CIP. Its Counter Terrorism Implementation Task Force (CTITF) under the Office of Counter Terrorism (OCT), has a Working Group on the Protection of CI, including Vulnerable Targets, Internet and Tourism Security; the collective responsibility of these departments is to work with member states in developing and supporting efforts in these three areas. In 2017, the UN departments unanimously adopted resolution 2341 on the "Protection of Critical Infrastructure and Enhancement of States' Capacities to Prevent Attacks against Critical Infrastructure". This invites members to consider the possible preventative measures they might take as part of overall national strategies and builds on the UN's own Global Counter-Terrorism Strategy under which member states have already resolved to "step up all efforts to improve the security and protection of particularly vulnerable targets, such as infrastructure and public places". In 2018, these UN departments, under the chairmanship of Interpol, published a comprehensive document titled "The Protection of Critical Infrastructures against Terrorist Attacks: Compendium of Good Practices". In the document, Interpol emphasises, amongst many other things, how the overlap between the physical and the digital world, including the ubiquitous availability of anywhere anytime connectivity, means that even the most strategic and important CI can now have both its cyber and physical elements controlled from almost anywhere in the world. Whilst this might be convenient for those running the CI, this new era of technological magic also makes CI, (that's controllable in such a way), extremely vulnerable to potential threats and makes effective and comprehensive CIP more important than ever before.

Considerations for Physical Access Control

One of the key areas for consideration in CIP is that of Access Control. At any CI site, this provides either the first line of defence against man-made threats as they approach a perimeter entrance, or it may offer a level-by-level approach to a secure, interior control room. In either case a range of procedures and systems will be employed and represent the boundaries between public/unrestricted and private/restricted areas.

Access control is one of the most crucial areas of CIP. Sites, such as nuclear power stations, hydro-electric power plants and

dams, oil refineries, transportation networks and others will not only have extensive exterior and perimeter areas and main entrances to watch and secure, but they will also have secure control rooms of one sort or another. These are where site personnel carry out critical operational processes and from which operations are monitored and controlled. Access to such control rooms is always restricted to authorised personnel only, those with business to be there based on the personnel security policies the CI site has in place. When considering access control security, not only must organisations think about matters 'on site', but they must also look to the wider world from where potential threats to their infrastructure, networks, IT and databases may come.

Organisations need to have clearly defined access control guidelines in place with clear delegation as to who is responsible for their implementation. They need to consider where every access point is and how staff, visitors and vehicles are all to be processed. Staff may all have passes, while visitors may need security clearance and will often need to be escorted at all times. Special procedures may also need to be in place for people making deliveries. Doors, windows, gates, will all require an accepted level of security apparatus/procedure in place involving such things as appropriate locking mechanisms, security lighting, CCTV, or other sensors and equipment. Each access point will need to be monitored and protected, with video analytics in place to analyse whatever information external/internal monitoring equipment detects, in order for appropriate responses to be set in motion.

When it comes to interior CI control rooms, security of such areas has typically placed its emphasis on the control of physical access by personnel. Individuals typically have to go through several access stages before reaching the control room itself, perhaps passing through more than one security area by showing a personal access card before eventually reaching the locked control room and opening it using the same access card, one final time. Once inside the control room, workstation security then presents another area of 'access', this time to the organisation's computer network, and the security and protection of an organization's cyber domain is a subject area in its own right and is not dealt with in this article.

Access Control – Keep Them Locked Out

In some utility sectors, where CI facilities are often remote and isolated, with doors or gates located out of doors, companies or local authorities can easily set up an efficient and cost-effective access control solution to secure their facilities. Smart keys and intelligent locking systems are on the increase in this area. One company involved in providing first line access control solutions for major CI, in this case for the electricity supply facilities and infrastructure of UK Power Networks (UKPN), is Locken. The company has equipped over 1,500 distribution sites with its digital access control smart locks allowing UK Power Networks to move away from mechanical key-locking systems to a solution built around smart keys and electronic cylinders. The Locken solutions deployed for UKPN include the LPCB4 electronic high-security padlock, which allows only registered, authorised personnel to access work locations. Each lock opening, or attempted opening, can be tracked on the system for subsequent analysis. Energy to power the all-digital system is supplied by the smart key itself; it has no mechanical key pattern, is reprogrammable to update 'rights access' info when necessary, and is impossible to copy. The corresponding



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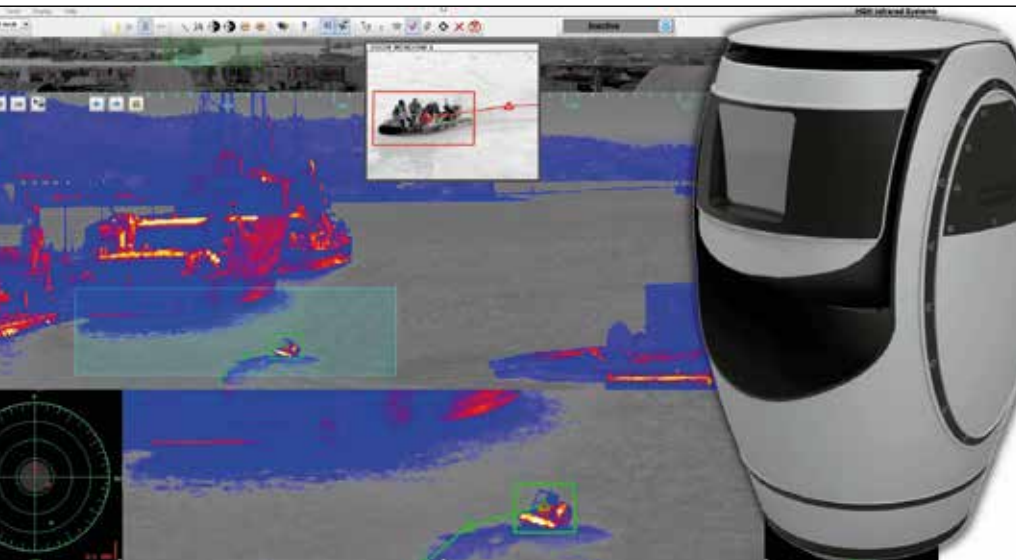


Photo: HGH

The HGH company claims that its SPYNEL system's 360° thermal sensor will detect any object, hot or cold, day and night.

electronic cylinders are passive, unlocking only on contact with a key, which provides the correct access rights and supplies the power. No data regarding access rights is stored in the cylinders, so changing access rights does not require going out to the actual locks. Latest Bluetooth, wireless and WiFi technology is employed by the Locken systems. The company's solutions are used in a wide range of CI sectors including the aviation sector in locations such as Toulouse Blagnac airport in France.

Ablox UK is another advanced lock solution player offering such systems as its PROTEC2 CLIQ Connect system, as well as secure electric locks, and LPCB-rated padlocks designed to protect against advanced criminal and terrorist threats. Its PROTEC2 CLIQ is a web-based security management solution that allows the remote management of dispersed, remote, or large-campus electronic master-

keyed sites at any time, from anywhere in the world. It maintains and provides comprehensive audit trails on cylinders and padlocks, recording who used each key, where and when, and can remove permissions quickly and easily for lost or stolen keys from the system, thereby providing tight key management at all times.

Keeping an Eye on Things – Surveillance

One critical element in CI protection is surveillance, where such systems as latest thermal and low light surveillance cameras can provide exacting information about approaching threats to a CI facility. Operators using these need to be able to identify the kind of threat involved; intruders detected might range from lost rambblers accidentally trespassing, to local vandals, criminals intent on theft of some sort (such as copper from

telecommunications sites), saboteurs, or to a full-blown terrorist attack. The surveillance system employed must offer sufficient clarity and information to be able to determine the appropriate course of action in all scenarios and while elements of traditional surveillance systems like microwave barriers, motion and seismic sensors could all fall foul to false alarms from the likes of wildlife and weather events new systems can overcome these drawbacks. Surveillance cameras combined with powerful analytics can allow operators at CI sites to determine the further intel required after an initial alarm to determine if action is needed; latest IP-based surveillance cameras featuring advanced video analytics can differentiate between a false alarm and a real situation. They can determine movement and also direction and 'remember' patterns that have caused real or false alarms previously. For thermal image cameras, advances in image sensor technology and chip design have led to greater uptake enabling improved surveillance of CI sites in total darkness without even having to rely on infra-red sources to be present, purely using the heat radiated from a target object itself for a 'visual'. While they can't deliver detailed images and clear identification, they can detect warmth through vegetation and radiating, for instance, around the edge of walls, or even through obscured weather conditions. Something detected by a thermal camera can then be further analysed using a low light camera, (which will be alerted by the first camera), to then capture colour video even in extreme low-light conditions, improving the chances of identifying the target subject. Employing such IP-based surveillance systems allows users to incorporate mobile devices into their surveillance apparatus, so that text messages can be sent automatically to alert control of an alarm, thermal images can be accessed and displayed remotely using a smartphone, all designed to make the surveillance of a CI site as effective, efficient, and secure as possible. It also makes systems scalable and capable of covering large and potentially remote areas with a real-time service.

One player active in the area of surveillance camera solutions for critical infrastructure is Axis Communications, which has just announced its AXIS Q1798-LE Network Camera that combines 4k resolution with an ultra-high-light-sensitive 4/3" image sensor for exceptional light sensitivity and forensic images in almost

A Market for Solutions

According to the market report "Global Critical Infrastructure Protection Market 2018-2028" available from ResearchAndMarkets.com, the CIP Market is expected to be worth more than USD118Bn annually by 2028. Major global CIP markets include North America (the largest), Europe and Asia Pacific. In terms of actual market segment importance, the report identifies physical security as that segment expected to account for the highest proportion of spending, driven primarily by the need to deploy adequate manpower across all those CI areas and establishments identified as potential terror targets. The US is the largest spender on physical security due to its vast infrastructure network, which includes thousands of essential facilities and plants, transportation systems and information technology structures. During the 10-year period covered by the report the physical security market is expected to account for a cumulative investment of over USD920Bn, while the network security and other segments are projected to account for around USD189Bn and USD31Bn, respectively. Together with physical security facts and figures, spend on the network security segment and others are also detailed in the report.

DRONE GUARD Against New Menaces

Since their appearance in the late 2000s multirotor drones have taken the world by surprise. Unlike unmanned aerial systems (UAS) pursued by the world's military forces under military research, development and supply channels, these drones, originally introduced for recreational use by hobbyists,

As they become more common in our daily life, drones also become potential menaces, when used by criminals and terrorists. So far, lethal use of drones was limited to the combat zones in Iraq, Syria and Afghanistan, but security forces around the world are certain that future

approach for detection, classification and targeting. For detection, the company's ELM-2026B X-band radar and passive Communications Intelligence (COMINT) can detect and classify targets from up to 5 kilometres. Electro-optical sensors may also be used to detect targets that maintain minimal or no radar signature. Once a drone presence is verified, the radar directs the Electro-Optical (EO) system to identify it. The combination of radar and SIGINT is part of Elta's multilayered detection capability that maximises the system's efficiency.

Once detected and identified, targets are mitigated by DRONE GUARD, using multilayered effects. The most basic effectors are electronic emitters used to jam and disrupt the drone's control and navigation channels, following different protocol that can fend off the drone from the guarded premises or bring it down safely using cyber takeover methods. Elta's effector portfolio may also include other effectors such as electronic warfare (EW) and 'hard kill' measures, to deal with specific environments and defeat existing and evolving threats.

DRONE GUARD's agility and adaptability sets it apart from numerous C-UAS systems available in the market. Relying on effective, advanced, software defined radar and sensors, the system provides the range and accuracy necessary for quick reaction, tracking and pointing of EO sensors while the integral COMINT package automatically classifies targets and reduces false alarms. Software defined jammers enable users to tailor jamming against a specific target or swarms or employ takeover protocols that adapt to evolving threats and scenarios. All these systems are controlled through a common interface that integrates all functions to simplify the operator's mission.

DRONE GUARD is tailored to address a wide range of applications, from relatively simple deployments to the most complex. The system is designed to counter present and evolving threats and endure the most challenging operating environments.

Offering a sophisticated and agile C-UAS capability, DRONE GUARD is well positioned to secure civilians and military forces against the growing menace of drones.



Photo: IAI

DRONE GUARD relies on software defined radar and sensors to fend off drones.

and filmmakers utilised highly integrated, miniaturised, cutting edge electronics designed for consumer communications systems that pack ultra-advanced capabilities including remotely controlled and autonomous systems (RC), that perform remote surveillance, precision navigation, secure communications and agile, jam-resistant communications.

Drone uses have expanded dramatically in recent years. By 2020 more than 100,000,000 drones are expected to roam our skies, used in civilian, commercial and scientific roles. They carry remote monitoring, metering, sensing and security missions, infrastructure surveillance, and agricultural services, fishery, forestry monitoring and control, delivering parcels and medical supplies, carry video cameras to cover sports events and more. Using open-source navigation and flight controls, amateurs and experts can hack drones to carry out missions they were never designed to do.

drones' lethal use will not be limited to warzones. In fact, the uninterrupted accessibility of drones could turn critical infrastructures such as gas and oil tanks, or chemical facilities into mega-explosives if exploited by terrorists.

As small, slow and low flying vehicles multirotor drones are hardly spotted from the ground by radar, camera or the human eye and, when strapped with rudimentary weapons, their simple yet effective control enable operators to use them as loitering weapons. In Iraq they were used by ISIS to spread havoc among Iraqi forces, defeated only with dedicated Counter-UAS (C-UAS) equipment that was rushed to the combat zone.

One of these C-UAS weapons is the Israeli DRONE GUARD, an integrated system that relies on multiple sensors to detect, classify, identify and defeat drone targets. Developed by IAI Elta Systems, DRONE GUARD employs a multi-layered

Photo: HGH



CYCLOPE intrusion detection is in use at civilian airports.

any scenario. With a x4 zoom and Canon lens, the new camera, (available as of October 2019), has IP66, IP67 and IK10 ratings, can handle extreme temperatures ranging from -40°C to +60°C and includes Axis' LIGHTFINDER 2.0 technology for increased light sensitivity, more life-like colours in almost complete darkness and sharper images of moving objects. December last year saw serious drone incursions disrupting London's Gatwick Airport CI in the UK. A leading player in protecting against such threats is HG Infra-Red Systems whose SPYNEL family of drone/UAV detection systems for defence and security applications is at the forefront of protecting against this latest threat to CI. A few years back its SPYNEL system was trialled by the French National Research Agency on behalf of the General Secretariat for Defence and National Security (SGDSN), and was duly selected to be part the French national protection plan against drone intrusions over critical infrastructure. Able to detect and track drones over 360 degrees, day and night, SPYNEL, sometimes described as 'infrared radar' showed that it provides the benefits of a thermal camera, that it can visualize threats day and night in total darkness, and offers the benefits of radar by automatically detecting and tracking an unlimited number of threats simultaneously through 360 degrees. Unlike conventional radar, SPYNEL is completely passive and cannot be jammed. It doesn't operate with a library-matching mechanism and, therefore, can detect even newly released UAVs, or modified commercial models. Following the London Airport event, HGH said its SPYNEL IR imaging cameras provide a surveillance solution able

to detect, track and classify any types of drone in such a scenario no matter what their configuration, whether fixed wing, multi-rotor, GPS-guided, autonomous and emitting low or no electromagnetic signature. HGH said that SPYNEL's 360° thermal sensor will detect any object, hot or cold, day and night. Supporting SPYNEL is the CYCLOPE intrusion detection software, which provides advanced features to monitor and analyse the 360°, high-resolution images captured by SPYNEL sensors, with its ADS-B plugin enabling aerial target identification and aircraft ADS-B data to be fused with thermal tracks to differentiate airplane from drone. Its forensics analysis offers timeline, sequence storage and playback possibilities, and it is also possible to go back in time to analyse the behaviour of the threat since its first appearance on the CYCLOPE interface. By using several SPYNEL sensors at the same time 3D passive detection of targets by triangulation is possible.

First-line Protection – Barriers

Physical security will attract the largest spend in the protection of CI in the coming years, not least of which will be in the form of barriers of one sort or another. The space available in the article does not permit a detailed look at this extensive and expanding industry sector, where bollards and shutters and a wide range of other barriers are being developed, impact tested and deployed to meet the ever-increasing threat from vehicle-borne terrorist attack such as lorry suicide bombers. Though a few lines hardly do justice to the science and

engineering, architectural constraints, and other considerations that must be taken into account in the development of such barrier systems, we'll at least take a quick look at a couple of players and offerings currently in the market to protect CI sites. In addition, the increasing need to protect public sites such as bridges and major thoroughfares in urban areas means that barriers and bollard systems are increasingly in demand for such deployments.

From barrier specialist Frontier Pitts which has supplied bi-folding and sliding gate systems and bollards to utilities and other critical infrastructure, airports and datacentres. The company's Terra Rising Bollard, which has been successfully impact tested to the new International IWA-14 specification, stopping a 7.2t vehicle travelling at 80kph (50mph), is a fully automatic, easy-glide, hydraulically-driven rising bollard mechanism providing 360° hostile vehicle mitigation protection from the threat of VBIED's (vehicle-borne improvised explosive devices). The company also produces its Terra 180° bi-directional, lightweight HVM barriers for access points to sites, which need to be secured with occasional access, out of hours security, or remote locations with power supply restrictions. The Terra 180° barriers require a shallow foundation embedment depth of just 350mm and can secure entrances up to six metres and is secured by an anti-tamper locking mechanism, which encases the barriers locking pin and is resistant from attack by a wide array of hand tools and battery powered tools. It has been successfully impact tested to the new IWA 14-1 specification stopping a 7.2t vehicle travelling at 48kph (30mph).

Designed to help protect facilities against emerging threats such as hostile incursion and swarm attack, Gilgen Door Systems' Rolegard SR5-B security shutter is said to combine the highest physical attack standard achieved in a security shutter with unrivalled ballistics and blast protection properties. To achieve its very high security rating the shutter was tested to LPS1175, issue 7, level 5 using a wide range of professional attack methods including the use of high-end power tools. The FB3 and FB4 ballistics ratings were achieved following stringent tests to satisfy the requirements of BS EN1522:1999. SR5-B also features a newly tested Automatic Self Locking (ASL) system designed to 'lock down' facilities without the need for secondary locks. ■

Geoinformation: Demands and Developments

Giulia Tilenni

Geoinformation is the representation and analysis of data on a map by an information device. The increasing number of Earth observation satellites and the possibility of using artificial intelligence to manage and prioritise the information collected are driving their use for military and security purposes.

The demand of geoinformation related products is growing along with the development of geospatial intelligence applications (GEOINT). GEOINT is a predictive analysis method focused on monitoring given variables on a map over time. Information gathered through GEOINT are then presented to users on an interactive multi-layered map integrating a scatter-plots. The more detailed the scatter plots are, the more comprehensive is the situational awareness of the users with regard to the issue that they are investigating. GEOINT techniques have been used for decades, particularly by domestic security services in the US, in order to monitor the activities of large groups.

For instance, the National Security Agency's (NSA) PRISM programme, which became famous with the 'Snowden case', is based on the gathering of metadata about words used. Given a normal distribution of words in an average conversation, the programme would automatically "red flag" conversations containing a higher number of occurrences in a given time frame. In case of a recurrence of these red flags over time, the NSA would initiate an investigation in the area where they occurred. Today, this principle can be applied to even more complex applications capable of monitoring multiple domains at once. Big data, sensors, satellites and other sources are so abundant now that multiple aspects of an issue can be monitored over time, thus providing the decision-maker with accurate situational awareness and even with some prediction capabilities based on behavioural analyses. The rise of artificial intelligence

Photo: NGA



The rise of artificial intelligence (AI) applications feeds the proliferation of geoinformation applications based on GEOINT methods.

(AI) applications feeds the proliferation of geoinformation applications based on GEOINT methods. As these applications have large potential, the demand for geoinformation services is increasingly focusing on developing currently existing GEOINT tool sets while also developing more ambitious new ones as well.

Game Changers in GEOINT

The impact that data gathered through GEOINT apps have on decision-making is strongly dependent on the amount of information obtained and on their relevance over time. The increasing number of earth observation satellites and miniaturisation have been "game-changers" in the development of GEOINT, as they make the collection of spatio-temporal information more regular and more affordable. The 200 meteorological and earth observation satellites that have been launched in the last decade provide high-

resolution, night and day monitoring of land, air and sea over a given time frame, providing continued observation of a given area. Once the user has designated the area of interest, observation satellites can be redirected to adapt GEOINT to the analysts' needs. As the number of satellites is expected to increase consistently until 2024, reaching up to 1,700 pieces, 1700 pieces, the amount of information that will be collected by space sensors is expected to grow accordingly, thus enhancing GEOINT performances. In addition, the fact that a growing number of satellites have synthetic aperture radars (SAR) instead of classic electro-optic sensors served to strengthen image quality, as it allows for the collection of images irrespective of the weather condition – a crucial issue in the past, especially in geographical areas with harsh weather conditions. ASI's COSMO-SkyMed constellation is one of the most remarkable examples of dual use space-earth obser-

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vation systems. Consisting of four-medium sized satellites, each one featuring a microwave high-resolution SAR, the constellation has all weather/day and night acquisition capabilities. The large number of radar images that this constellation can

be used along with them to provide the best results possible. Indeed, nano-and micro-satellites can provide persistent even if not high-resolution images of an issue, which can then be better observed due to the information collected by more

combined, the more time and professionals are needed to deliver insights about the issue being analysed. The biggest drawback is that the advantage of capturing real-time information is lost because the delay between capturing information and providing analysis can be weeks or even months in more complex cases.

Digital technologies can help solve these problems by automating part of the analysis cycle and making it faster. This has led to the development of new Activity Based Intelligence (ABI) methods that include the use of Artificial Intelligence (AI).

ABI is a set of spatio-temporal analytic methods based on the integration of metadata collected through different intelligence gathering solutions. It helps analysts to overcome difficulties derived from the data's variety, volume and veracity, allowing for analysing quicker elements "in motion". ABI is an important support to GEOINT activities, as the rapid merging of information allows for discovering relevant patterns that could then be reshaped according to the changes identified to enhance the quality of intelligence gathering. The ABI deductive method allows analysts to maximise the widespread information gathering that modern technologies can bring, as they can adapt collection to their needs and rapidly merge consistent and heterogeneous data sets.

Applying AI to this process makes it even faster. For instance, AI software can rapidly, if not instantly, select useful information according to given criteria, or merge information on the same issue but gathered by different tools to show them on a unique thematic map. Moreover, AI can merge heterogeneous data sets into homogeneous outcome. The emergence of deep learning techniques relying on a neural network approach, coupled with hardware evolution, makes classification, detection and segmentation more accurate. By being applicable to several ABI needs, from very high-resolution satellites to constellations of micro-satellites, deep learning techniques make ABI more efficient.

Applications

AI is a push factor for the development of GEOINT-tailored technical services that transform raw information into usable data. Indeed, AI software can map and monitor several issues, from critical infrastructures to crisis management and maritime security. Not surprisingly, the demand for AI applications in the GEOINT domain is particularly strong in countries, who are heavily investing in AI Research and Development, namely Japan, China and US.

Photo: US Airforce



Traditional imagery analysis involving a map and a pen has been slow and tedious and has been replaced by computerised geointelligence.

gather are increasingly exploited for feeding GEOINT applications. This capacity is exploited both in-house, with products such as SEonSE (Smart Eyes on the SEa), and by external service providers (see also below).

Miniaturisation

Miniaturisation as well has been maximising the utility of information gathered through GEOINT applications, as it makes data flows more consistent due to applications in satellites and processors. The development and deployment of nano- and micro-satellites, over the last decade, is expected to rise in the coming years. As a result of miniaturisation, satellites are now much smaller than in the past and, therefore, cheaper in terms of construction and launch costs. Modularity in payloads given by products such as CUBESATS has made producing and launching satellites more affordable for a growing number of actors interested in GEOINT activities, from institutions to private companies. Even if some technical obstacles remain, such as propulsion and power storage, these satellites can be launched in large numbers to compensate for their limits. Moreover, despite the fact that image resolution is lower compared to bigger models, they could

performing satellites in order to provide analysts with more comprehensive data. Miniaturisation has also an important role when it comes to processors as it constantly increases technical capabilities in stocking and processing a vast amount of data. More performing stocking and calculating power raises GEOINT efficiency, as it allows for better populating maps and, consequently, to considerably raise users' spatio-temporal situational awareness of the area of interest.

Adapting GEOINT to Metadata

The important contribution of satellites and miniaturisation to GEOINT in terms of data supply has multiplied the amount of information to be analysed. In particular, analysts have to cope with a large number of high-resolution images collected in near real time that have to be merged with relevant information collected through other tools (for example, social media) before they can be converted into meaningful data. However, dealing with such a flood of information is time-consuming. Although the digital tools that analysts rely on are becoming increasingly powerful, especially in terms of computing power, analysts remain at the core of raw data processing. The broader the spectrum of information to be

The US-based company Orbital Insight is one of the leading companies in geospatial analytics. As a result of its remarkable cloud computing, machine learning and AI tools, the company can provide cloud-based products that gather, process and transform multiple geospatial datasets. Orbital Insights, which is in charge for monitoring 85% of US refineries, offers several solutions for the public sector, for instance for the detection of new infrastructures and the characterisation of military activities.

Moreover, the US government is seeking to externalise data collection activities and libraries to better focus on analysis, thus encouraging the development of new solutions and software.

After having lagged behind, European countries have recently understood the importance of entering the "AI race". Thus, dedicated investments in Research and Development have been increasing both at the national level (namely in France) and at the European level, in particular in the EU multiannual financial framework 2021-2027. AI applications to the intelligence cycle are part of this effort, with European companies already working on the development of dedicated software.

For example, the Italian company e-GEOS (a joint venture of ASI and Telespazio) with its service portfolio, which combines images from the Cosmo-sky med constellation with metadata from various unclassified data sets, is a leading provider in the field of geoinformation. The services will be offered in multiple versions to optimally adapt them to the application areas, including civil and military applications as well as applications for defence and intelligence services. To this end, e-GEOS offers the BraINT solution, a state-of-the-art modular IMINT analysis environment that integrates proprietary solutions with bespoke tools to support analysts throughout the intelligence cycle. The system can be used by defence ministries, defence agencies and security institutions for target analysis and/or monitoring, detection, damage assessment and mapping. Since 2018, the company has also provided a platform for the naval environment, Smart Eyes on the SEas (SEonSE), to provide users with meteorological and oceanographic information or the exact position of ships. Not surprisingly, E-Geos, in collaboration with Orbital Insight, is using cloud computing solutions and AI tech-

niques developed by the US company to analyse high-resolution images collected by the Italian company.

On 24 April 2019, Airbus Defence and Space and Orbital Insight launched their partnership in the development of the Earth Monitor analytics software. This explains well how merging existing libraries and platforms with machine learning can maximise users' knowledge, allowing them to allocate resources in a time-efficient manner. Earth Monitor is expected to track changes over pre-registered and new areas of interest through Airbus' imagery archives and satellites capabilities and Orbital Insight's dynamic algorithms that can detect changes in near real-time, for example, traffic analysis and detection of new infrastructures.

France will be one of the European countries who will invest the most in the development of AI technologies – €100M a year between 2019 and 2025, as the draft by Defence Minister Parly (dated 5 April) shows. In addition to large companies, such as Thales and Nexter Robotics, a dozen digital start-ups have specialised in AI applications in the defence sector. Two of them, Geo4i and EarthCube, are working on the development of AI tools for image analysis.



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A European Approach

European collaboration in the space domain is one of the most remarkable successes of the EU. Indeed, European countries have been able to build a system that could not only provide raw information but also perform the whole intelligence cycle due to the work of dedicated agencies.

For what concerns information gathering, European companies working in the GEOINT domain could rely on informa-

agriculture and local planning), health, transport, civil protection and tourism.

To better serve EU foreign policy activities, the European Union Satellite Centre (SatCen) provides the European External Action Service (EEAS) with fast and reliable analysis of information gathered by earth observation, thus providing support to humanitarian and aid missions, contingency planning and general surveillance. SatCen also monitors and analyses critical infrastructures, military capabilities and weapons of mass destruction. Following

responding to crisis situations such as political or armed conflicts.

In April 2019, the European Commission launched a call for proposals for projects under the European Defence Industrial Development Programme, one of the instruments introduced last year to create a genuine European defence. As proof of the importance that GEOINT and related disciplines have for European countries, the ISR-PEO call focuses on improving persistent Earth observation from space through "automated interpretation of data and information, including artificial intelligence, cloud solutions and real-time on-board processing by sensors".

The prototype to be developed by the contractor shall implement the ABI concepts by automatically extracting units from different data sources in order to gain insights from the aggregation, correlation and monitoring of such units with respect to patterns and anomalies. In line with these developments, the ABI systems should be applicable as a new tool for Intelligence, Surveillance and Reconnaissance (ISR) missions. The requirements also include support to GEOINT analysts in defining the most appropriate data planning and collection strategy to perform ABI tasks, in particular for sea and land applications. Due to its AI features, the ABI method is expected to reduce the workload of analysts for data preparation in order to focus on the contextual analysis of GEOINT.



Photo: NGA

GEOINT permitted the US Special Forces to locate, identify, describe, and define Osama Bin Laden's compound in Abbottabad, Pakistan, prior to engagement. Shown here is an NGA model of the compound.

tion gathered through one of the most ambitious Earth observation programmes in the world – Copernicus. Born out of the collaboration of the European Commission with the European Space Agency (ESA), this user-driven programme is aimed at developing European information services based on information gathered due to the Copernicus Sentinel satellites constellation (with the eventual support of Contributing missions) and in situ-sensors managed by the European Environment Agency.

Raw data collected by Copernicus' satellites will then be converted into usable information by six Copernicus services with different environmental and security specialisations – land, sea, atmosphere, climate change, emergency management and security. As a result, the information collected under the programme helps decision-making in areas such as structural policies (for example, fisheries,

the delegation agreement signed in 2016, the European Commission entrusted SatCen with the operations of the Copernicus Service in Support to External Action (SEA), the EU geo-intelligence service, which became operational in 2017. This provides relevant national and European stakeholders (EU Commission, EEAS and people serving the Common Security and Defence Policy) with increased situational awareness on crisis prevention and management.

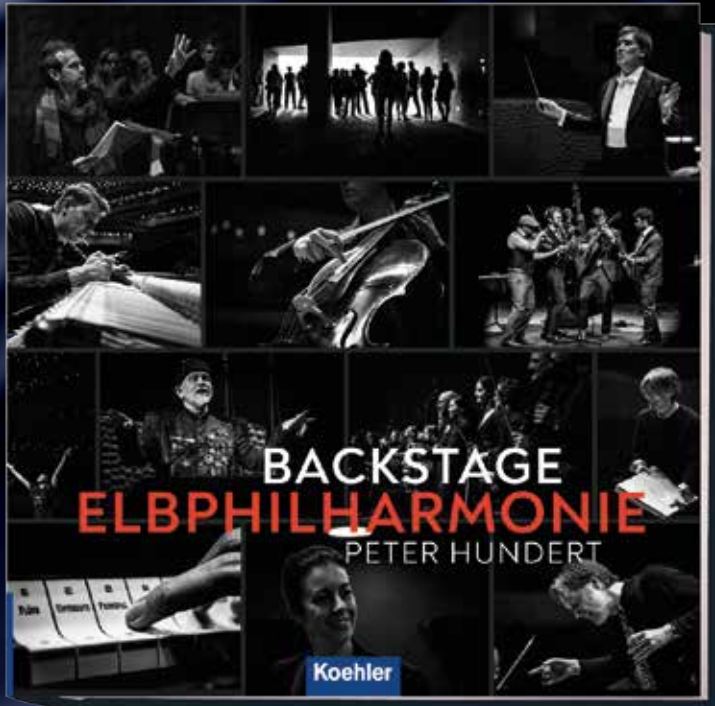
Users who are interested in detecting and/or monitoring events outside the EU, but who have a potential impact on the EU, can request geo-information on demand, which will be analysed and delivered in tailor-made news products. Satellite images can be presented in various forms, from short reports to detailed thematic maps. The service can provide both continuous monitoring of the issue as well as rapid intelligence support in

Final Remarks

It is expected that GEOINT will gain in importance in the future. The multiplication of Earth observation satellites, including nano- and microsatellites, provides real-time information on the evolution of certain issues occurring in a given area over a period of time. This information can then be merged with that collected by other methods. Technological innovations help to cope with the enormous volume of information as they speed up the transformation into exploitable intelligence. If the ABI method allows better management of sources of complexity and uncertainties in data, the AI software can perform some tasks autonomously. These technological advantages have allowed analysts to focus on the most challenging tasks, bringing great benefits to the entire intelligence cycle.

This innovative approach to geo-information, which focusses on the analysis of data flows, improves the reaction time of decision-makers and thus realises the information superiority of users. ■

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Lead-Free Ammunition: Technical and Tactical Advantages

Thomas Nielsen

Ever since the beginning of the handheld firearm, lead has been a choice material for projectiles. This continues to this day, where lead remains the most common core material for small arms projectiles.

Lead has many advantages for this purpose: It is dense, lending mass and thereby momentum to the projectile, and it is relatively soft, which allows the projectile to deform, and adapt to the rifling of the weapon without undue wear and tear. It is also relatively inexpensive and it allows the projectile to easily be designed to deform on impact with a soft target, if that is a requirement.

duction and in use. Consequently, considerable effort has been expended in finding alternatives, especially in recent years, with the increasing focus on the environment, and on our activities' impact on same. Indeed, when lead-free ammunition was initially developed for large scale use (i.e. military service ammunition), this was mainly due to increasing environmental concerns on (military) firing ranges.

is an advantage or a disadvantage often depends on the situation.

Internal Ballistics

As already mentioned, lead is a relatively soft metal and, as such, it deforms easily, allowing a lead projectile to conform to the rifling in the firearm without causing undue wear.

Source: men-defence

LFI

5,56 mm x 45 · 7,62 mm x 51

The LFI's point of impact is virtually identical with the dispersion pattern of the combat ammunition. This ensures solid training as there is barely any difference between the training and the combat ammunition.

Owing to the low projectile weight, the LFI's point of impact is positioned slightly downwards.

For the training ammunition, the worst case is displayed here with a 100m distance. Based on the current load, the deviation is approx. 2-3cm.

Extract from the firing protocol 5,56 mm x 45 (110 yds):

● 5,56 mm VM DM 41 ● 5,56 mm LFI ● 5,56 mm QD

5,56 mm x 45	
· Cartridge weight:	177,0 gr
· Bullet weight:	54,0 gr
· Powder charge:	26,0 g
· Gas Pressure:	≤ 430 Mpa

Example of lead-free training ammunition

However, lead is not without its problems. It is toxic, both to humans and to the environment, which is an issue both during pro-

As such, lead-free ammunition is nothing new in this day and age, with the "lead-freeness" of the ammunition extending to either the projectile, the primer or both.

However, in some areas there has been considerable resistance to the introduction of lead-free ammunition, mainly due to a perceived reduction in performance. Taking this as a starting point, and acknowledging that much has already been written about the environmental issues surrounding lead-free ammunition, the present article will investigate potential "non-environmental" advantages to lead-free ammunition. As the discussion progresses, the reader should keep in mind that whether a particular feature of a projectile or an ammunition

If the lead is replaced with a harder metal, such as mild steel, this will inevitably have an impact on the deformability of the projectile and, as a consequence, may increase barrel wear.

Other materials with approximately the same malleability as lead, such as tin, lack the density of lead (tin being approx. 7.280 kg/m³ vs. leads approx. 11.340 kg/m³). Lack of density can lead to less optimum ballistics, especially at longer ranges (see next section).

External Ballistics

As indicated above, almost all the alternatives to lead for projectile construction, at least the ones that are priced to allow

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Test of lead-free expanding ammunition in ballistic medium – penetration approx. 23cm

large-scale bulk use, are less dense than lead. This of course means that, for a similar projectile geometry, the lead-free projectile will be lighter. Since the projectile is lighter, it can typically be launched at higher muzzle velocities without exceeding permissible pressure levels.

A lighter weight projectile will also have less momentum, and will therefore lose velocity at an increased rate, thereby reducing effective range.

In some scenarios, primarily law enforcement or military operations in close quarters, this can be an advantage, since the downrange hazard in case of a missed or perforating shot is kept to a minimum. Similarly, due to the reduced momentum, penetration in the target is limited, which again reduced the risk of a perforating shot and the ensuing danger to anything behind the intended target. When used for training, reduced penetration will typically also mean reduced damage to firing range backstops, which in turn leads to reduced life-cycle cost.

As stated in the introduction, there are of course also situations where this limited penetration will be a disadvantage, such as tactical scenarios involving intermediary targets.

So far for identical projectile geometries. However, if we are allowed to adjust the projectile geometry to account for the decreased density of the projectile, the situation changes somewhat.

Given a particular (non-lead) projectile material with less density than lead, and a given calibre, the only option if we are to maintain projectile mass is to make the projectile longer.

Increasing the length of the projectile, keeping other parameters unchanged, increases the coefficient of form for the projectile. This in turn leads to an increase in the ballistic coefficient, and thereby improved velocity and energy retention at range. In other words, for the same

projectile mass, a lead free projectile will, typically, show improved external ballistic performance.

The author stresses, however, since many other factors influence external ballistics, including the quality of the projectile construction and its shape, this should be taken as a general rule of thumb rather than as a ballistic commandment.

Terminal Ballistics

Terminal ballistics are, in the opinion of the author, the place where the most gain can be achieved by using lead-free projectiles. In the case of small-arms projectiles, terminal ballistics almost per definition means anti-personnel.

There exists a number of yardsticks for terminal ballistics, but the one that seems to have gained the most popularity is the so-called "FBI Test". Without going into too much detail, the FBI Test consists of a series of live-fire tests, where the ammunition in question is fired against ballistic medium, both "bare" as well as covered by simulated clothing, or behind simulated automobile glass or automobile door frames. The performance of the ammunition in terms of straightness of trajectory, expansion and penetration is then assessed.

Especially when fired against automobile glass and ditto doors, one of the primary projectile failure modes is core-jacket separation where, during penetration of glass or metal, the stresses imposed on the projectile cause the jacket (typically a copper alloy) to separate from the lead core. Such a loss of projectile integrity naturally has a severe negative impact on terminal ballistic performance.

For a monolithic lead-free projectile, typically made from a copper alloy, this of course ceases to be an issue, since there is no longer a distinct jacket and core to separate.

As mentioned above under external ballistics, lead-free projectiles, typi-

cally being less dense than lead, have less momentum, which tends to reduce penetration. The above-mentioned FBI Test requires a minimum of 12" (approx. 305mm) penetration in ballistic medium, a requirement that is more problematic for lead-free projectiles due to the aforementioned reduced momentum. However, as the test shown below demonstrates, lead-free ammunition can still give good account of itself in terms of penetration:

Depending on the situation, reduced momentum and the resulting reduction in penetration can also be an advantage. For operational use, there are situations where minimising the risk of overpenetration is vital, such as most hostage rescue scenarios. A previously mentioned, for training ammunition, using projectiles with reduced momentum, especially if combined with a deformable or frangible projectile design, reduces wear and tear on backstops.

Conclusion

There is no question that lead-free ammunition is here to stay, primarily due to environmental concerns. However, when considering and evaluating a change to lead-free ammunition, it behoves the ammunition technician and logistician to keep in mind that lead-free ammunition will not necessarily have reduced performance, and may indeed have operational advantages. ■

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Italy to Strengthen its Amphibious Power Projection Capabilities

Luca Peruzzi

Built under the Legge Navale fleet renewal programme, the Italian MoD and Fincantieri recently celebrated the launch of the TRIESTE Landing Helicopter Dock (LHD).

With a ceremony attended by Italy's President of the Republic Sergio Mattarella and his daughter Laura, the latter as the ship's godmother, the former Minister of Defence Elisabetta Trenta, the Italian Chief of Defence, General Enzo Vecciarelli, and the former Chief of the Navy, Vice Admiral Valter Girardelli, at Fincantieri's Castellammare di Stabia (near Naples) shipyard on 25 May 2019, the Italian MoD and Fincantieri celebrated the launch of the TRIESTE Landing Helicopter Dock (LHD), the largest warship built under the Legge Navale fleet renewal programme. Built and under fitting-out by a consortium led by the Fincantieri shipbuilding group as prime contractor, and Leonardo as combat system integrator and main sub-contractor, the contract worth €1.1Bn was awarded by the Italian MoD's Naval Armament Directorate (NAVARM) and became effective on July 2015. The contract includes a logistic and training package with support during the shipbuilding (including courses, spare parts and technical documentation), and in-service support for the first ten years. Leonardo is the prime contractor and integrator for the combat system, and is the main contributor of equipment, together with Fincantieri, Elettronica and MBDA Italia.

With the first steel cut celebrated in July 2017 followed by the keel block laying ceremony in February 2018, the shipbuilding takes place at Fincantieri's Castellammare di Stabia shipyard, where the ship will complete the propulsion and ship management fitting-out in order to launch the sea trials by March 2020. The ship will then move under its own propulsion to the Fincantieri's Muggiano shipyard near La Spezia on June 2020 to complete the platform systems and combat system outfitting. Sea trials are set for August 2021, with delivery planned for June 2022.

The new ship, designed under the dual use and multi-purpose by design concepts to carry out a wide range of missions, from supporting amphibious and power projection operations at sea in national and multi-



Photo: Luca Peruzzi

Italy's new TRIESTE Landing Helicopter Dock (LHD) after launch

national contexts, to maintaining the Community by supporting civil protection and multinational organisations in disaster relief, humanitarian, medical and evacuation operations, will also be able to perform the command functions of complex amphibious operations as a CATF/CLF (Commander Amphibious Task Force/Commander Landing Force) platform. "The new TRIESTE LHD is planned to replace the current GARIBALDI LHA platform, maintain the operational capabilities provided during its lifetime, in addition to the intrinsic amphibious, transport, medical, command and control, and support capabilities of the LHD", said the former Chief of Italian Navy. As with the GARIBALDI LHA, which is currently replacing the CAVOUR STOVL aircraft that have undergone an important overhaul and upgrade to accommodate the Lockheed Martin F-35B STOVL aircraft, it is assumed that the LHD will perform the same operations when maintenance stops occur or when an additional deck is required for a national or international operation.

The recently published Italian Navy's "Strategic address lines 2019-2034" docu-

ment highlights the need to maintain an amphibious power projection capability to be provided at joint armed forces level through the "National Sea Projection Capability" thanks to an Amphibious Ready Group with a minimum of four platforms, including a larger platform for command and control (LHD) and the remaining platforms acting as "primary ships". The latter are today represented by the three SAN MARCO/SAN GIUSTO class LPDs.

With an overall length of 245 metres, an overall beam of 47 metres and 36 metres at flight deck level, a construction height of 27.7 metres and a displacement of over 33,000 tonnes with a draught of 7.2 metres, the new LHD has a full length deck with a ski-jump, and a starboard-positioned island based on two separated blocks, similarly to the new Royal Navy's QUEEN ELIZABETH class aircraft carriers, two lateral elevators connecting the flight deck with the hangar in the central-stern area, hospital, accommodation and C4ISR facilities in the bow-central areas in the lower decks and a stern well deck with forward heavy-vehicles garage with lateral and stern ramp doors for ground vehicles and naval craft.



Photo: Marina Militare

The internal bay of the TRIESTE

The new LHD is classified by RINA Services according to the international pollution prevention conventions – such as those addressed in the MARPOL Convention and those not yet binding, such as those covered in the Hong Kong Convention introducing the concept of the "Green Passport".

The new platform has spacious accommodation for a total of 1,064 people, including beds for 360 crews, while the remaining beds are divided between aviation and support, command and control, and amphibious. TRIESTE LHD will be able to ensure the support of a 600-man amphibious battalion thanks to its aviation, naval and transport capabilities. Other facilities are dedicated to the NATO Role E Hospital, and the interoperable C4ISR in NATO, European and international contests.

The new LHD features a CODOGOL propulsion (Combined Diesel Or Gas Or Elec-

tric) based on two shafts with controllable pitch propellers (CPP) and rudders provided by Fincantieri two Rolls-Royce MT30 gas turbines with 36 MW each, two MAN 20V32/44CR diesel engines with 12 MW each, and two 2.21 MW-each Marelli Motori electric motors. The electrical power generation package for both ship systems and propulsion is based on four 5.2 MW-each MAN 9L32/44CR gensets. The propulsion and electrical power supply packages are accommodated in two separated and not contiguous compartments, each hosting a gas turbine, a diesel engine, and an electric motor connected through a Renk gearbox to one shaft line, each assisted by two diesel generators. The platform is equipped with two retractable stabilising fins to support operations in high-sea states as well as two bow and one stern thrusters to facilitate operations in restricted waters. Based on the required speed and mission,

the ship can reach the following maximum speeds: 10 knots with the two electric motors for amphibious flight and transit operations in environmentally restricted areas, 18 knots with the two diesel engines for transit and repositioning operations and 25 knots with the two gas turbines for high-speed repositioning. The ship's range is 7,000 nautical miles at 16 knots.

With a maximum length of 230 metres, a beam of 36 metres and a 7,400 sqm area, the flight deck of the LHD has a port-side ski-jump, which features a 12 degrees ramp (the same like the CAVOUR STOVL aircraft carrier), and a flight deck port runway for the Lockheed Martin F-35B LIGHTNING II STOVL aircraft, together with nine landing and take-off spots (including one for SAR and two for emergencies) for Italian Navy's EH-101, SH-90, AB-212 and future Light Utility Helicopter (LUH) in addition to large CH-47 and CH-53 helicopters and MV-22 or future national tilt-rotors, all being moved to the hangar and vice versa with two lateral elevators (14x15 metres) with a 40-tonnes payload capacity. The LHD is also fitted for unmanned air vehicle (UAV) operations including dedicated command and control capabilities and facilities. The ship's starboard island features two separate superstructure blocks to accommodate the operational centres for ship and flight operations management, in addition to surface and air surveillance sensors and communications equipment. Each of the two superstructures blocks accommodate two of the four fixed faces (4FF) X-band STARFIRE Active Electronically Scanned Antenna (AESA) new-generation radar to ensure 360 degrees' coverage around the ship and the long-range and ballistic-missile defence capable L-band fully-digital KRONOS Power Shield radar positioned on the forward island block, both provided by Leonardo together with the Distributed Static Staring (DSS) IRST sensors. The communications and EW mast is installed on the rear island block, together with the flight operational managing sensors. The forward and midships areas of the underneath decks accommodate the mess and various compartments, the combat operational centre, afloat C4I, and flight departments in addition to crew accommodation areas, while various compartments around the hangar perimeter are devoted to a range of uses. The hangar deck accommodates the NATO Role 2E hospital, crew accommodations and the hangar areas. The hangar has a size of 2,200 sqm (21x107 meters with a height of 7.8-10.7 meters) and can accommodate helicopters, aircraft or vehicles. The hangar is equipped with facilities for third-level maintenance on heli-



Photo: Rolls-Royce

A Rolls-Royce MT30 gas turbine fitted on the TRIESTE

copters as well as dedicated facilities for the F-35B operations and support, including two 10-tonnes overhead travelling cranes. The fully-equipped NATO Role 2E hospital (expandable with sheltered solutions in the hangar) with a size of 770 sqm has operating rooms, radiology and analysis rooms, a dentist's office, and patient rooms capable of hosting 27 seriously injured patients. The underneath decks forward-central areas are for crew and troops accommodation. The garage deck (55x18 meters) has a 700 sqm surface and up to 235 linear metres of parking for heavy vehicles up to 62 tonnes like the ARIETE main battle tanks, while the well deck (50x15 meters) can accommodate up to four new type L23 LCM (Landing Craft Medium) with a 70 tonnes payload capability specifically built by Cantiere Navale Vittoria under Italian Navy's requirements to enter-into-service with the new ship, as well as one LCAC and the landing craft in service with NATO and the Marina Militare. In addition to the four L23 LCMs, the organic LHD assets package include two 15 meters type FFC15 high-speed multirole boats under construction by Baglietto Defence for the programme and two-each 7.1 and 9.3 meters RHIBs. The movements between the two transport decks (hangar and garage) are assured by a 4 metres internal ramp and a 40-tonnes elevator, while the rear well deck (18x6 metres) and the starboard (6.5x5 metres) ramp doors of the same garage deck have a maximum capability of 62 tonnes. Smaller elevators for the hospital and ammunitions are available together with two 30-tonnes cranes on the flight deck for materiel, vehicles and boats embarkation/disembarkation. The hangar and garage decks have a total area of 4,500 sqm and the additional flight deck has an area of 1,500 sqm, while the C4I facilities have an area of 740 sqm. The new amphibious assault ship can also carry 2,600 m³ of F76 fuel and 2,000 m³ of F44 fuel, in addition to 600 m³ of water and 350 tonnes of munitions.

Ship Management and Combat System

The Italian Navy and NAVARM requested the industry to develop common ship management and combat system suites for all the Legge Navale's vessels, including the PPA, LHD, LSS and UNPAV with the opportune diversities based on the unit types and different tasks. The Integrated Platform Management System (IMPS) is provided by Seastema, a Fincantieri subsidiary, and it belongs to SEASNAVY, a new generation product family, while the SADOE Mk4 is the latest generation Command Manage-

Photo: Luca Peruzzi



The TRIESTE is multi-purpose by design and can carry out a wide range of missions

Photo: Luca Peruzzi



A prototype of the new multipurpose console for Leonardo's Combat Management System

ment System (CMS) develop by Leonardo for the Italian Navy. The CMS has an open architecture with a modular and scalable structure to satisfy the requirement of the different types of platforms and missions; it is centred on innovative and lightweight composite-built consoles with a single large 43-inch touch-screen multifunction display, available on board in 32 units (plus one integrated on the bridge together with the same commander station used on the PPA), and which user-friendly operational reprogrammable software, processing power and database management are provided by remotely-based processing and data management centres with particular attention to cyber protection. The main bridge and the combat operational centre are equipped with five tactical tables developed by Leonardo together with Seastema and Martec, as well as large wall displays, all together with amphibious operation managing capabilities including un-

manned platform and naval surface firing support (NSFS). The interoperability in naval and amphibious environments as well as in other operational scenarios require a high level of data and voice connectivity which is ensured onboard the Italian Navy's new warships by the extended multi-standard communications suite based on Leonardo's SWAVE family of Software Defined Radio with conformal and conventional antennas. The LHD will be equipped with an extensive integrated suite with V/UHF, HF radios, multiband (C/X/Ku and X/Ku/Ka) military and commercial SATCOM, LTE, wireless, GMDSS and tactical data Link 11, 16, 22, VMF and JREAP managed by Leonardo's Multiple Data Link Processor (MDLP), voice (telephone, recording, broadcast, intercom and emergencies) and data (data network, large-band (LTE) wireless, Wi-Fi, video teleconference and internet protocol television), with over 50 RTX channels in addition to the data link ones and advanced cyber



Photo: Luca Peruzzi

A model showing the two-blocks island with the KRONOS Power Shield

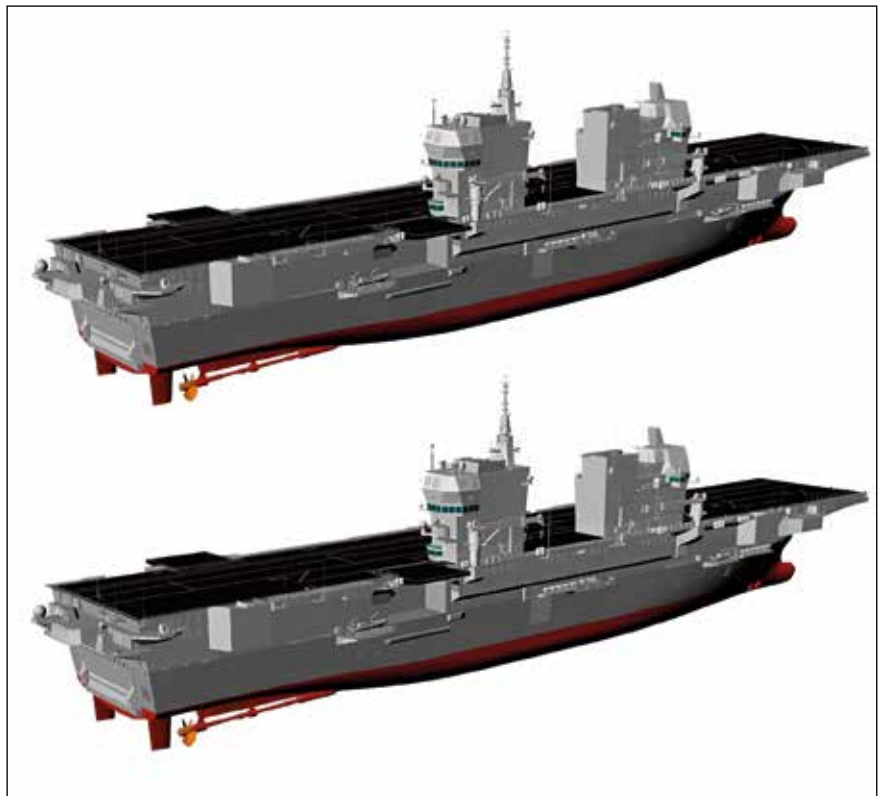
defence capabilities both for the IPMS and the combat system. The navigation suite includes inertial systems, GPS, WECDIS and AIS systems, as well as dual-band ('X' and 'Ka') GEM Elettronica's GEMENI DB navigation radars.

The integrated sensors' suite includes the same new-generation Leonardo 4 fixed-faces (4FF) X-band StarFire AESA radar used on the First-of-Class (FoC) Thaon di Revel PPA (and part of the Dual-Band – 'X' and 'C' band – Radar (DBR) suite, to be installed on the PPA's Full capable platform to be delivered in 2024) with provisions for the 'C' band addition, and the new-generation Leonardo L-band KRONOS Power Shield early warning radar characterised by an AESA rotating antenna and fully digital architecture with 'digital beam-forming' for long-range surveillance, detection and tracking of both air breath and ballistic missiles targets. These radars are integrated with Leonardo's new SIR-M5-CA IFF system equipped with conformal antenna and electronic beam scanning, compatible with most recent NATO standards, sided by advanced transponder. The Electronic Warfare suite (EWS) is based on the same configuration designed and provided for the Italian Navy's PPA class

but tailored on LHD ship requirements. The integrated suite includes RESM (Radar Electronic Support Counter-Measure), CESH (Communication ESM) and RECM (Radar Electronic Counter-Measure) with an extremely powerful electronic attack subsystem based on solid-state AESA array with GaN (gallium nitride) technology-applied T/R modules capabilities managed by a EW C2 unit to be effective in both blue water and littoral operation, with an enhanced Maritime Surveillance and Situation Assessment through advanced features, including innovative SEI (specific emitter identification) algorithm capabilities. The EW suite is interfaced with a multi-type decoy launching system and a reaction management system (RMS) controlling the two ODLS-20 (Oto Melara Decoy Launching System) launchers for air, surface, and underwater defence.

lia TACAN with lightweight electronically scanned antenna and Calzoni visual landing aids.

The ship's protection against air, missile and surface threats is ensured by an ILDS (Inner Layer Defence System) suite based on three 76/62mm SUPER RAPIDO Multi-feeding gun mountings in the STRALES configuration with DART guided ammunition and VULCANO long-range ammunition, each controlled by a new-generation NA-30S Mk2 fire control system with dual-band ('X' and 'Ka') radar and EO/IR suite. For short-range self-protection, Leonardo provides three remotely controlled KBA 25/80mm guns with EO/IR FCS, the first such application for the Italian Navy and foreign customers. The ship is also fitted-for but not equipped with the MBDA Italia SAAM Extended Self-Defence (ESD) air-defence system based on two vertical launching



Graphics: Italian Navy

The LHD will also share the same Distributed Static Staring (DDS) IRST EO/IR suite equipping the PPA in order to ensure 360 degrees coverage around the ship, as well as a Sitep Italia surveillance and protecting suite consisting of Multirole Acoustic Stabilised Systems (MASSs) with long-range surveillance and non-lethal weapons systems.

The air traffic and approach are managed by the Leonardo SPN-720 solid-state, low probability of Intercept (LPI) naval precision approach radar, an AN/SPN-41 Instrument Carrier Landing System (ICLS), Thales Ita-

system (8 cells each) for the ASTER 15/30 on the starboard ship's side. The underwater protection is provided by the Obstacle Avoidance System (OAS) sonar provided by Leonardo together with the BLACK SNAKE towed-array torpedo detection system (TDS) integrated with the RMS (Reaction Management System) to operate the new Mobile Jammer Target Emulator (MJTE) underwater decoys being deployed by the two ODLS-20 decoy launchers, in addition to Sonardyne International SENTINEL 900 diver detection system as Leonardo subcontractor supply. ■

Unmanned Surface Vehicles – an Emerging Resource

USVs in the Republic of Singapore Navy (RSN)

Guy Toremans

The rapidly expanding portfolio of Unmanned Surface Vehicles (USV) brings innovative warfighting capabilities to maritime operations. Unmanned systems have started to play an important role in the modern naval battlefield.

The growing interest lies in the fact that USVs are well suited to carry out a wide range of missions (such as mine countermeasures (MCM), anti-submarine warfare (ASW) and intelligence, surveillance and reconnaissance (ISR)), are able to be de-

ployed from a variety of host platforms, can be manufactured at much lower costs and can be operated without onboard human operators. Within Southeast Asia, the Republic of Singapore Navy (RSN) was the first to deploy USVs during real operations, for example the 9 metre Rafael PROTECTOR USV embarked on-board the ENDURANCE class

landing platform dock RSS RESOLUTION. During RSS RESOLUTION's three-month deployment to the Northern Arabian Gulf in 2004/2005, the PROTECTORs were used to assist in protecting critical infrastructures, such as the Basrah Oil Terminal, from

the nation's forces for 2030 and beyond, by means of a progressive increase on unmanned vehicles in all domains. The Republic of Singapore Navy (RSN) upcoming fleet renovation will focus on the integration of unmanned surface vessels and the latest developments in robotics, artificial intelligence and data analytics. The navy is arguably further advanced in the area of experimental USVs for future naval combat. This is not only the result of anticipating the navy's future operational needs but also in view of Singapore's manning constraints (the low total fertility rate continues to affect the Republic of Singapore's Armed forces in general) and the desire to reduce the vulnerability of its personnel.

The VENUS Family

The RSN is experimenting with different USV types for various tasks, such as the VENUS family, developed by the Marine Division of the Singapore Technologies Engineering company (ST Engineering). The VENUS USV is an indigenous effort believed to have grown out of Singapore's previous involvement in the US Navy's Spartan Scout Advanced Concept Technology Demonstration (ACTD) programme. The VENUS series ranges from the 5.5 tonne VENUS 9 with a payload capacity of 2.5 tonnes over the 11 tonne VENUS 11 with a payload of 4.5 tonnes, to the 26 tonne VENUS 16 with a 10 tonnes payload capacity. These craft can operate autonomously with multi-modal collision detection and collision avoidance (CDCA) software, using radar tracker and vision-based obstacle/target detection, multi-sensor fusion and navigation chart processing and capable to perform autonomous waypoint navigation, screening and blocking, while the modular approach facilitates the integration of a wide range of mission modules. Seen as

Photo: Guy Toremans



One of the RSN's VENUS 16 USVs with two Expendable Mine Disposal Systems onboard

terrorist attacks. Line-of-sight communications and control was exercised from aboard RSS RESOLUTION. Their mission payload comprised a TOPLITE electro-optical director for surveillance and weapon control, a Mini-Typhoon stabilised weapon station, a searchlight, a Long Range Acoustic Device (LRAD) and a microphone. The RSN still operates an undisclosed number of 9 metre Rafael PROTECTOR USVs, a rigid hull inflatable USV.

In a document titled "Building the Next Generation Singapore Armed Forces", published in March 2019, the Singapore Ministry of Defence outlines the future of

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a critical issue for the still embryonic future surface combatant programme – the Multi-Role Combat Vessels (MRCV) – the RSN is in the midst of testing several variants of the VENUS 16 USVs.

In May of this year, ST Engineering Marine Division unveiled the latest iteration of its VANGUARD series of modular surface vessels – the VANGUARD 130 – at the IMDEX ASIA 2019 Maritime Exhibition in Singapore. The VANGUARD 130 design combines a full-fledged surface combatant with a mother-ship capable to deploy and recover a wide array of unmanned systems such as UAV, USV and UUV. Flushed doors on its port and starboards sides support launch and recovery of remotely operated vehicles (ROVs) and autonomous underwater vehicles (AUVs). The platform can be equipped with an ST Engineering in-house designed launch-and-recovery system (LARS) for handling a wide range of small crafts and unmanned surface vehicles such as RHIBs and USVs, known as the Q-LARS 2.0.

The Anti-Mine VENUS

The VENUS 16 Mine Countermeasure concept, where one VENUS 16 is fitted with a Towed Synthetic Aperture Sonar (TSAS) to conduct underwater scans to detect and classify mines, while another VENUS 16 embarks the ECA K-STER Expendable Mine Disposal Systems (EMDS) to carry out the mine detection and neutralisation to conduct mine disposals. Both versions feature autonomous collision avoidance and Satcom systems to cancel any blind spots caused by geographical and shipping reasons. This waterjet-propelled USV can attain speeds in excess of 30 kn and has an endurance of up to 36 hours. The craft is controlled by a 2-person crew in a 20 ft TEU container that can be located either ashore or deployed from a ship. This concept will eventually replace the navy's ageing BEDOK class mine countermeasure vessels (MCMVs).

The Coastal Defence Venus

Another type undergoing trials is the VENUS 16 coastal defence variant, specifically configured for maritime security and force protection operations. The USV can navigate by waypoint navigation and maintain its position relative to other vessels and operate autonomously in proximity with other vessels thanks to the in-built Collision Detection and Collision Avoidance system (CDCA). A series of tests in the Singapore Strait, the busiest shipping lane in the world, began late 2015 and are anticipated



Photo: Guy Toremans

The racks to store the ECA K-STER Inspection and EMDS ROVs onboard a VENUS 16 USV



Photo: Guy Toremans

The RSN's 9m Rafael PROTECTOR USVs were deployed onboard the ENDURANCE class landing platform dock RSS RESOLUTION during the latter's three-month deployment to the Northern Arabian Gulf in 2004/2005.

to be completed by the end of 2019. The RSN is expected to effectively commence patrols around Singapore with these USVs from 2020 onwards. Eventually, these USVs will take over the patrols that are currently undertaken by the navy's VICTORY class patrol boats and the Independence class Littoral Mission Vessels (LMVs), thus freeing up these units to be deployed at further ranges and for more complex missions.

The Anti-Submarine VENUS

The RSN and the ST Engineering's Marine Division are also testing an anti-submarine warfare (ASW) variant of the VENUS 16 fitted with a launch and recovery system for dipping sonars, a hull-mounted sonar system performing active and passive search and tracking incoming torpedoes warning and small object avoidance system. This type of USV could be deployed in high-risk shallow water zones and prosecute targets such as UUVs that are using small, super-

cavitating weapons or lightweight torpedoes before those targets have a chance to threaten the larger surface combatants.

Surveillance USVs

In the coming years one will see the USVs being used in a very pronounced role carrying out intelligence, surveillance and reconnaissance (ISR) tasks. These craft should feature extensive communications capabilities, using recoverable tethered optical fibre buoy-type acoustic communications (ACOM) and satellite communications (SATCOM), have the capability to operate at long stand-off distances and be able to remain on station for extended periods. Such USVs would be especially suited for ISR missions in constrained waters. The transit to their area of operations would be conducted in a passive mode in order to gather intelligence on the signatures of passing vessels or to provide target-ac-

Photo: Guy Toremans



The Singapore-based company ZyCraft displayed its 16.6m VIGILANT Independent Unmanned Surface Vessel (IUSV) and, in the background, the M75 unmanned target boat USV.

quisition data. ST Engineering's Marine Division is responding to this future need by offering its SUPER SWIFT Interceptor USVs. Designed for a variety of missions, including pursuit and arrest, search and rescue, offshore and border patrols, escorting other vessels and (covert) surveillance operations, the company already offers three versions: the SUPER SWIFT 17 Ultra Fast Interceptor / Patrol Craft; the SUPER SWIFT Special Operations Craft / Coastal Security Craft and the SUPER SWIFT 35 Ultra Fast Patrol Vessel. These craft feature the advanced Air Cavity Hull (ACH) designs, are capable to achieve high speeds without compromising stability, manoeuvrability and seakeeping.

The interceptors, either equipped with a waterjet propulsion, or surface-piercing propellers allowing speeds in excess of 60 knots, can be equipped with small calibre guns, remotely controlled weapon stations (RWS) and explosive ordnance disposal (EOD) systems.

The VIGILANT

Another likely contender for the RSN's unmanned surface vehicles procurement programme is the Singapore-based ZyCraft's 16.6m VIGILANT Independent Unmanned Surface Vessel (IUSV).

This USV has a resin hull, reinforced with carbon nanotubes, and is equipped with a SEAKEEPER stabilisation system enabling the IUSV to operate in high sea states, even during monsoon seasons. A SIMRAD 4G radar and collision avoidance software ensures safe operations in congested waters. The two YANMAR 6LY3-ETP engines allow the VIGILANT IUSV to attain a top speed in excess of 30 kn, achieve at least 3,000

nautical miles or a 25-day of endurance at a 6 kn loiter speed. The IUSV can carry fuel and mission payload of up to 7,000 kg. In a surveillance role they are fitted with a radar, an automated identification system (AIS) and high-definition cameras featuring smart sensors for automated surveillance and transmit the images in real time. This type of USV was originally designed to escort merchant ships as they made their way through waters known for piracy and sea robbery activities.

ZyCraft recently completed an unmanned deployment of a VIGILANT IUSV for 22 continuous days during with the vessel, sailing at 5 knots, travelled some 1900 nm and command and control done via satellite communications. The IUSV was run on auto-pilot mode and carried out autonomous vessel and obstacle avoidance using its proprietary software and information from its on-board cameras.

Challenges

While today's USV concepts represent an impressive vision, there is still a significant amount of work to be done. Although tremendous efforts have been dedicated to make USVs more autonomous, there remain numerous key technical issues to be solved in order to bring the autonomy up to the level required for more sophisticated and hazardous applications, such as communications robustness, continuous bandwidth availability and sufficient power for propulsion and to operate them at very long ranges, but also have sufficient power to make a sustained and full use of the 'power-hungry' organic sensors and communications systems.

The pursuit of next-generation defence innovations presents a range of com-

plex challenges for Singapore's defence planners, from identifying and prioritising emerging technologies, to adapting them to new force structures using novel operational concepts. One must see how the USVs can be fully integrated with the manned units, their impact on concepts of operations (CONOPS) and procedures, their implications for operational doctrines and on the rules of engagement (RoE), the effect on education and training, as well as on how autonomous robots and humans will be able to interact more closely on the battlefield. One cannot ever talk about autonomous and unmanned systems without bringing up the cyber vulnerabilities; there must also be a strong focus on defending the unmanned surface vehicles from cyber-attacks. The inherent vulnerabilities are the linkages.

Ultimately, the strategic logic and goal remain unchanged: to create viable defence options and political effects. In this context, the key lesson from past military innovations is this: breakthroughs in technology alone will not guarantee successful innovation.

Obviously the utilisation of USVs will continue to increase and show that craft with much higher autonomy levels will allow to operate at a much longer time without the intervention of human operators. The most important trend is the intelligence levels of the USVs. With the advent of the AI, previously impossible task such as recognising enemy vessels through the camera images can be automated.

Future Concepts

A number of companies are also looking into the integration of large- and medium-sized USVs. Again, the marine division of ST Engineering is anticipating this trend by offering its conceptual 45 metres Long Endurance Unmanned Surface Vessel (LEUSV), designed to perform anti-submarine warfare, maritime patrol and surveillance tasks. The hull-form enables good sea-keeping even during the monsoon seasons, while their hybrid combined diesel and electrical propulsion system allows long range operations at loitering speeds. Other trends that are being looking into are to convert manned vessels into unmanned platforms, and for 'optionally manned' USVs. With the increased interest in reducing ships' crews, there is potential for 'retrofitting' smaller vessels and turn them into fully autonomous or into a 'mix and match' approach where certain elements of the ship can be controlled autonomously. ■

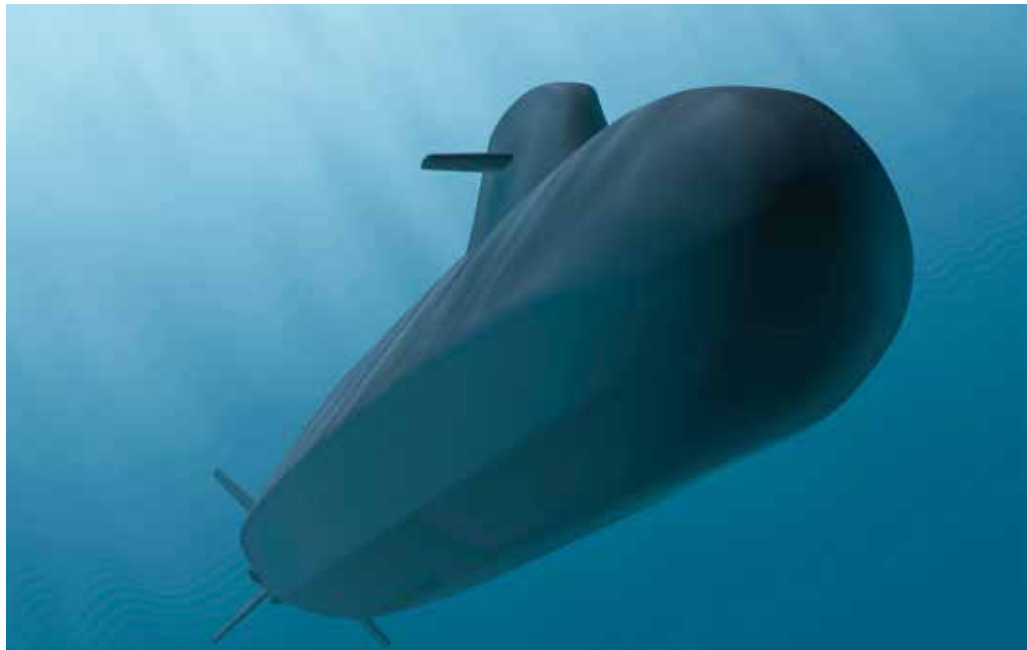
German Naval Shipbuilding in the European Context

Dieter Hanel

As an industrial nation, Germany is dependent on exports. As an exporting country, Germany has considerable economic and security interests, which is why German security policy must have a maritime component.

The privately managed German naval shipbuilding industry has achieved a strong market position in Germany and abroad with new high-performance products. However, the industrial policy observed in numerous European countries, in particular with state-owned companies in France, Italy and Spain, to secure national defence capacities and key technologies and to support export activities by the government increases competitive pressure. This pressure is also intensified by the restrictive German arms export policy. As a consequence, the inevitable consolidation of Europe's highly fragmented naval shipbuilding industry has become a distant prospect.

Photo: tkMS



Capacities and Strategic Orientation

As a large industrial nation, Germany is highly dependent on exports and, as a leading exporting country, has considerable economic and security interests. This is why German security policy must have an important maritime component. In terms of security policy, economy and technology, Germany needs an efficient, globally active naval industry to preclude overdependence on foreign countries and to ensure participation in international armament cooperation.

Since the end of the Cold War, three trend-setting strategic corporate decisions, also determined by the security situation, have contributed decisively to maintaining the

Against the background of the bilateral 212CD submarine programme, thyssenkrupp Marine Systems and ATLAS ELEKTRONIK have established kta naval systems as a 50/50 joint venture with Kongsberg of Norway. kta naval systems is to become the supplier of submarine CWCS for all future submarine programmes of tkMS.

efficiency and international competitive position of the German naval industry to this day: firstly, maintaining defence technology as a core business, secondly, developing technologically market-leading products, and thirdly, intensifying the development of foreign markets.

The construction of naval ships requires a special technological competence and a high system capability in the integration of complex technological fields such as sensor technology, propulsion technology, electronics, weapon system technology, protection technology and lightweight construction as well as efficient project management. In particular, the demands on IT security and networks as well as on the command and weapon control system (CWCS) network and on missile defence are increasing.

The German naval industrial base comprises the shipyards and the supply industry and can be divided into the following system areas: Surface combatants, conventional submarines, MCMV and combat boats, naval support vessels and subsystems, including propulsion systems, CWCS and radar systems.

The Shipyards

Nine shipyards and around 400 suppliers are active in German naval shipbuilding. These shipyards are system houses and global technology leaders in their specific product areas. They have undergone considerable consolidation and restructuring in recent years, and at the same time German Naval Yards Holdings has entered the market. The current ownership, capacities

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Picture: A&R



Abeking & Rasmussen can offer the APEX PROTECTOR MCMV with a non-magnetic steel hull.

and structures make it clear that a German shipyard alliance, as it has long been favoured by the German government, has little chance of success.

The thyssenkrupp Group made a major contribution to the consolidation and restructuring of naval shipbuilding. The Kiel-based company was formed in 2005 from the merger of the former Howaldtswerke-Deutsche Werft (HDW) in Kiel, HDW-Nobiskrug in Rendsburg, Blohm+Voss and Blohm+Voss Repair in Hamburg, Nordseewerke in Emden, Kockums in Sweden and Hellenic Shipyards in Greece. ATLAS ELEKTRONIK has also been part of thyssenkrupp Marine Systems since 2017. This means that thyssenkrupp Marine Systems can not only cover shipbuilding, but also a significant share of CWCS and in particular underwa-

ter sensors and weapons – a unique selling proposition among German shipyards.

Today thyssenkrupp Marine Systems, with annual sales of more than €1Bn, employs over 5,000 people at its Kiel, Bremen, Hamburg and Emden sites. The company is the world leader in the development and manufacture of non-nuclear submarines. Since 1960 it has signed contracts with 20 states for 165 submarines, 112 of which were built in Germany and 53 of which were made from prefabricated material packages with technical support from Germany in the respective customer country.

A technological quantum leap was made with the development of an air-independent submarine propulsion system based on noiseless and emission-free fuel cells.

The Class 212A and 214 submarines can thus operate submerged for considerably longer than comparable purely diesel-electric boats. In exports, thyssenkrupp Marine Systems is currently particularly successful with its Class 214 submarines, which are also equipped with a fuel cell propulsion system and take extended deployment scenarios into account.

The core business of thyssenkrupp Marine Systems also includes the development and design of state-of-the-art frigates, corvettes and naval support vessels as well as a wide range of services. Together with the Lürssen shipyard, thyssenkrupp Marine Systems is currently supplying the four F125 class frigates for the German Navy in the ARGE F125 consortium.

With the abandonment of the surface shipbuilding shipyards, which have belonged to German Naval Yards in Kiel since 2011 and to Lürssen Werft in Hamburg since 2016, the thyssenkrupp Group has made a far-reaching strategic decision in this market segment. Hellenic Shipyards (2010) and Kockums (2014) were also sold as part of the focus on the core business.

thyssenkrupp's decision to abandon the Emden site of thyssenkrupp Marine Systems was suspended until 31 December 2020 due to the announcement by the Ministry of Defence and the coalition agreement between the Christian Democratic Union (CDU) and the Social Democratic Party (SPD) that surface shipbuilding is regarded as a key technology in Germany.

With approx. 2,700 employees the Lürssen Werft group of companies, to which the Bremen-based Fr. Lürssen Werft with the Aumund, Berne and Lemwerder divisions, the Lürssen-Kröger Werft in



Schacht-Audorf (since 1986), the Neue Jadewerft in Wilhelmshaven (since 2004), the Norderwerft in Hamburg (since 2012), the Wolgast-based Peene-Werft (since 2013) and Blohm+Voss (since 2016) belong, has pursued a successful strategy of growth and specialised orientation in recent decades. Lürssen is the lead company in the K130 corvette joint venture, which also includes thyssenkrupp Marine Systems and German Naval Yards Kiel. The contract to build five K130 corvettes for the German Navy was signed on 12 September 2017.

German Naval Yards is a new shipyard group in the German State of Schleswig-Holstein, to which the three shipyards German Naval Yards Kiel, Nobiskrug and Lindenau belong. It is owned by the Privinvest Group, which also includes CMN in France, Isherwoods in Great Britain and PISB with the shipyards Hellenic Shipyards and Abu Dhabi Mar. Privinvest has over 2,500 employees worldwide.

In addition to working on the construction of the five German class K130 corvettes, German Naval Yards Kiel, which employs 450 of a total of 950 people in defence technology, is currently building four corvettes for the Israeli Navy under the leadership of thyssenkrupp Marine Systems. German Naval Yards, as general contractor in cooperation with thyssenkrupp Marine Systems, has submitted a final bid for the development, design and construction of the German MKS 180 multi-role combat ship.

With 440 employees in the naval business area the Abeking & Rasmussen shipyard develops and manufactures in Lemwerder mine countermeasure vessels, patrol boats as well as special ships up to 125 m in length.



Photo: Federal Police

The first new Federal Police (Germany) vessel was launched at the Fassmer shipyard in Berne in December 2018.

The Fr. Fassmer shipyard has developed special units for the integration of flexible warfare and surveillance systems based on a modular design concept. These include the 1,850 t displacement OPV 80 class blue water patrol vessels. According to Fassmer, the company employs 1,500 people worldwide.

The Supply Industry

The German naval shipbuilding industry has a broad-based, efficient, medium-sized supplier industry that has successfully positioned itself at German shipyards and abroad. The locations are not limited to the coastal states – a large part of the supply industry is located in Baden-Württemberg and Bavaria.

ATLAS ELEKTRONIK, as a system house for naval electronics, supports navies all over

the world in their mission to ensure maritime safety. The company, which can look back on frequently changing ownership structures, has been a wholly-owned subsidiary of thyssenkrupp AG since 2017 and has been assigned to the thyssenkrupp Marine Systems division. ATLAS ELEKTRONIK's product range includes sonars and sensors, command and control systems for submarines and surface vessels, mine warfare systems, unmanned underwater vehicles, radio and communication systems, naval weapons and coastal protection systems. In October 2017, thyssenkrupp Marine Systems and ATLAS ELEKTRONIK established the 50/50 joint venture kta naval systems with the Norwegian company Kongsberg in view of the forthcoming joint Norwegian-German programme of six Class 212CD submarines. The company is headquartered in Kongsberg, Norway, with a

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LÜRSEN





Photo: Lürssen

The Peene-Werft shipyard based in Wolgast on the Baltic Sea has been part of the Lürssen Group since 2013.

branch in Bremen. kta naval systems is to become the exclusive supplier of command and weapon control systems for thyssenkrupp Marine Systems. Gabler Maschinenbau is a leading supplier of hoistable masts, special equipment and other components exclusively for submarines. Hagenuk Marinekommunikation, an independent subsidiary of the ATLAS ELEKTRONIK Group, is the European market leader for integrated submarine commu-

nication systems and one of the world's leading manufacturers of integrated radio communication systems. As part of its strategic reorientation and concentration on the aerospace industry, the Airbus Group has disposed of extensive parts of its defence electronics business, which in 2017 became the new defence technology company HENSOLDT with around 4,000 employees and sales of around one billion euro. This puts it in 63rd place among defence companies

worldwide. HENSOLDT generates 24% of its sales in the maritime segment, which includes radars, optronic systems, periscopes as well as electronic and data transmission systems. Class 212A submarines, Class K130 corvettes and Class 125 frigates are all equipped with HENSOLDT products.

Raytheon Anschütz, a subsidiary of Raytheon Company, USA, is one of the world's leading manufacturers of integrated bridge systems and nautical equipment such as gyro compasses, autopilots, rudder control and monitoring systems, radar equipment, electronic charts, radio and communication systems. Strategically, the company has undergone a transformation from a pure component supplier to a systems supplier, with the result that integrated navigation and bridge systems are increasingly being supplied today, combining its own and third-party products into a single system.

Renk is a leading transmission manufacturer with 2,319 employees and a turnover of €502M in 2018. The Maritime Transmissions business unit develops and produces transmissions for naval vessels. The ships of 35 navies worldwide are equipped with Renk transmissions. Class 125 frigates and Class 130 corvettes also have Renk transmissions.

The Rohde & Schwarz technology group develops, produces and markets communication, information and security technology products, which it also supplies to naval forces. In 2018, the company had 11,500 employees and a turnover of 2.04 billion euro. R&S Marinesysteme GmbH was founded with the aim of concentrating development activities at the Kiel location on the national and international naval business. The company develops and implements system solutions for secure communication and reliable telecommunications and electronic reconnaissance on board naval vessels.

Rolls-Royce Power Systems, headquartered in Friedrichshafen on the Lake Constance and a division of Rolls-Royce plc, supplies diesel engines for naval vessels. Class 212A submarines, Class 130 corvettes and Class 125 frigates are equipped with Rolls-Royce diesel engines from MTU.

Siemens supplies drives, switchgear and automation systems for naval vessels. Major ongoing projects include Class 212A and Class 214 submarines and Class 125 frigates. The Siemens PERMASYN propulsion engines and fuel cells are core components of the air-independent submarines.

European Frigate Programmes			
Country	Programme	Scope	Contractor
Germany	Class F125	4 frigates, contract award 2007	ARGE F125 (thyssenkrupp Marine Systems, Fr. Lürssen)
Denmark	IVER-HUITFELDT-Class	3 frigates, contract award 2006, commissioning 2011	Odense Staalskibsværft, closed 2012
France	FREMM	8 frigates, deliveries until 2022	Armaris (Naval Group/Thales)
	FTI (frégate de taille intermédiaire)	5 frigates, 1 st unit 2023	Naval Group
UK	Type 26 Frigate	3 (1 st batch) of 8 Frigates contract award 02/07/2017	BAE Systems
	Type 31e Frigate	5 frigates (1 st batch) contractor selection 09/2019, delivery of 1 st unit 2023	Babcock
Italy	FREMM	10 frigates, deliveries 2012-2020	OSN (Fincantieri/Leonardo)
The Netherlands	DE-ZEVEN-PROVINCIEËN Class	4 frigates commissioning 2002-2005	Damen Schelde Naval Shipbuilding
Norway	FRIDTJOF-NANSEN Class	5 (4) frigates, contract award 2000, commissioning 2006-2011	Navantia
Spain	F-110	5 frigates, contract award 23 April 2019	Navantia

Thales Germany realigned its naval organisation in 2018 and merged the Wilhelmshaven and Kiel sites into a new, cross-location unit. This integrated business unit will further expand marine competence in joint teams. This will enable them to develop and supply customer solutions in the areas of mission control systems, submarine solutions and naval communications solutions.

In 2015 Finnish Wärtsilä took over the L-3 Marine Systems International group from the L-3 group, which includes Wärtsilä ELAC Nautik and Wärtsilä JOVYATLAS EUROATLAS. ELAC is a market leader in the field of hydroacoustics with innovative areas of digital underwater communication and the introduction of open system architecture for submarine sonars.

Capacities and Perspectives in Europe

In contrast to the aerospace industry, naval shipbuilding in Europe remains highly fragmented. In France, Great Britain, Italy, Sweden and Spain in particular, despite a strong shrinking process and in-



Photo: Orizzonte Sistemi Navali

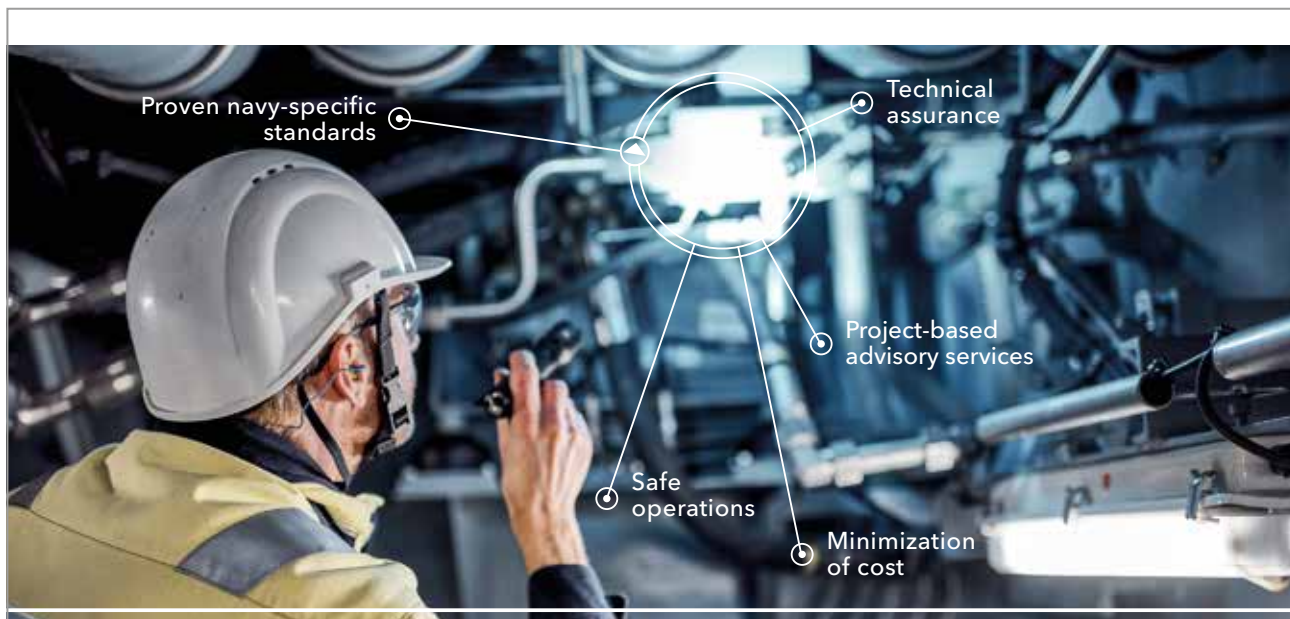
The Italian frigate CARLO BERGAMINI is one of ten Italian FREMM Class frigates, the last of which is scheduled for commissioning in 2020.

creased cross-border cooperation, there are still considerable capacities to be found which are supported by national industrial policy, domestic procurement projects to secure technologies and jobs, and successful foreign projects.

Cross-border procurement programmes are still rare in naval shipbuilding. The FREMM frigates and the Logistic Support Ship (LSS) are the only bilateral naval shipbuilding projects of 13 European programmes managed by OCCAR. FREMM is a series of frigates that France and Italy have been building since 2007 in a joint project in different configurations and designs for their respective na-

val forces. FREMM stands for the French Frégate Multi-Mission and the Italian Fregata Multi-Mission. The LSS is also a Franco-Italian project for supply vessels of both countries' navies.

The discussion of creating a "Naval EADS" or "Naval Airbus" analogous to the European aerospace industry, which has been recurring for decades, has not yet been generated results. With the acquisition of the Swedish shipyard Kockums in 1999 and the takeover of the Greek Hellenic Shipyards by thyssenkrupp in 2002 and their integration into HDW, a European shipyard alliance was created for the first time. The establishment of a



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European naval alliance, analogous to the EADS and Airbus aviation groups, was thus increasingly propagated, and HDW's 1998/1999 annual report announced this "as an early orientation towards a European market". However, this strategy was not successful. Nor was the "Joint Declaration by German Chancellor Gerhard Schröder and German naval shipbuilding companies of 28 October 2000" to view the strategic alliance between Babcock

erful companies with strong political support and international strategic success in naval shipbuilding.

Naval Group is a European leader in naval shipbuilding, developing, manufacturing and servicing aircraft carriers, frigates and submarines. In addition, Naval Group has expanded its business activities in the field of drones. In 2018, the group had a turnover of €3.6Bn with 14,800 employees. The company is owned directly by

The shipyard *Constructions Mécaniques de Normandie (CMN Group)* was taken over by Iskandar Safa in 1992 and belongs to the PRIVINVEST Group based in Lebanon.

With 19,274 employees and a turnover of €5.47Bn, the Italian shipyard *Fincantieri* is one of the world's largest shipbuilding companies and the largest naval shipyard in Europe. It is a partner of foreign shipyards in major supranational naval shipbuilding programmes. Its broad product range includes aircraft carriers, frigates, corvettes, OPVs and submarines. The Italian state has a direct stake of 71.6% in the company.

Since 2014, *Fincantieri* has been cooperating with *Leonardo*, Italy's largest defence industrial element and number 13 worldwide, with 46,262 employees and a turnover of €12.24Bn, with the aim of bundling expertise in naval shipbuilding and developing markets. For this purpose, both companies have founded the joint venture *Orizzonte Sistemi Navali (OSN)* as a system integrator (*Fincantieri* 51%, *Leonardo* 49%). *OSN* is the system integrator for the ten Italian *FREMM* frigates, the eighth of which was handed over to the Italian Navy in April 2019.

In addition to the strong focus of the Italian naval industry's surface activities on France, there are still close relationships in submarine construction with Germany.

The German-Italian cooperation in the procurement of *Class 212A* submarines, which began in 1996, was regulated by an intergovernmental agreement between the MoDs of both countries and by an industrial agreement between the German submarine yards and the Italian shipyard *Fincantieri* as licensee. Italy now intends to continue the German-Italian submarine cooperation and has signed a government memorandum of understanding with Germany on 10 March 2017 for the planned procurement of a further four *Class 212A* submarines.

The British naval shipbuilding industry has undergone profound restructuring in recent years in the form of mergers and plant closures. *Vosper Thornycroft* was taken over by *BAE Systems Maritime* in 2011 and the *DML Appledore* shipyard, taken over by *Babcock* in 2007, was closed in 2019. On the basis of the "National Shipbuilding Strategy" published on 6 September 2017, the future orientation of British naval shipbuilding is being undertaken in connection with the planned procurement programmes of the Royal Navy. This is primarily driven by national interests. The industrial policy aims to build the ships in Great Britain with British design and the involvement of foreign partners and to support British industry in its export efforts by the Government in order to maintain the

Photo: Michael Nitz



The most recent product from German Naval Yards is the Israeli corvette *INS MARGEN*, shown here during outfitting in Kiel, Germany.

Borsig and *Thyssen Krupp Industries* "as a decisive element in the restructuring of the European defence industries" a successful one.

In 2003, *Jean-Marie Poimboeuf*, then CEO of the French shipyard group *Direction des Constructions Navales (DCN)*, now known as the *Naval Group*, advocated an "EADS of the Seas" and saw European defence policy and joint industrial projects as the key driving force. However, both are still lacking today. In 2005, under the heading "European Shipyards Unlikely to Consolidate", *Defense News* listed the six largest European companies in naval shipbuilding: *BAE Systems*, *DCN* (now *Naval Group*), *Fincantieri*, *Nantavia*, *Thales* and *thyssenkrupp Marine Systems*. These continue to exist as independent shipyards, and so, as shown in the following, there are still substantial nationally determined capacities in naval shipbuilding in Europe. This strong national orientation and fragmentation is exemplified by the major European frigate programs of the day.

In France, *Naval Group*, *Thales*, *Chantiers de l'Atlantique* and *CMN* are three pow-

erful companies with strong political support and international strategic success in naval shipbuilding. *Naval Group* is a European leader in naval shipbuilding, developing, manufacturing and servicing aircraft carriers, frigates and submarines. In addition, *Naval Group* has expanded its business activities in the field of drones. In 2018, the group had a turnover of €3.6Bn with 14,800 employees. The company is owned directly by

the French state (62.25%) and by *Thales* (35%). In 2002, *Naval Group* founded the 50/50 consortium *Armaris* with *Thales*. Major programmes include the *FREMM* frigate project, the construction of nuclear submarines for the French Navy and conventional submarines for foreign navies.

On 14 June 2019, *Naval Group* and *Fincantieri* signed a cooperation agreement with the objective of establishing a 50/50 joint venture based in Genoa for the *POSEIDON* project by the end of the year. The aim is to "strengthen cooperation in naval shipbuilding and create a more efficient and competitive European shipbuilding industry". In 2017, the Italian shipyard *Fincantieri* took over 50% of the shares in the French *STX* shipyards and continues to operate them under the old name *Chantiers de l'Atlantique*. The French Government retains a 34.3% stake. *Chantiers de l'Atlantique* and *Naval Group* have jointly developed the *MISTRAL* Class landing helicopter dock and command vessel. *Chantiers de l'Atlantique* is building the four ships planned for the French Navy.

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national shipbuilding capacities, so successfully done in the Australian HUNTER Class frigate programme (nine frigates) and in the Canadian Medium Service Combatant (up to 15 ships based on the Type 26 Global Combat Ship).

This Government strategy is closely linked to the Royal Navy's major naval programmes such as the Type 31e frigate, also known as the General Purpose Frigate, the Type 26 frigate, the ASTUTE nuclear submarine programme and the QUEEN ELIZABETH class aircraft carriers. The strong government support is also reflected in the successful marketing of British naval products abroad. With 85,400 employees and a turnover of £18.4Bn in 2018, BAE Systems is the largest European defence company and number seven worldwide. Of these, 16,000 are employed in the maritime sector, which has a turnover of £2.98Bn. The two British aircraft carriers of the QUEEN ELIZABETH class, the Type 26 frigates and the ASTUTE submarines make a decisive contribution to the utilisation of maritime capacity.

Babcock International Group, with 35,075 employees and a turnover of £4.47Bn, 47% of which is in the defence sector, is the second-largest defence technology company in Great Britain and a major participant in the Royal Navy's major naval programmes. In the naval sector, sales amounted to £1.69Bn. The privately-owned Dutch company Damen Schelde Naval Shipbuilding had a turnover of €2Bn in 2018 with 12,000 employees, including 3,500 in the Netherlands. The naval shipbuilding programme includes frigates, patrol boats and MCMV. The shipyard has submitted a final offer for the procurement of the German MKS 180 and intends to have the ship built by the Lürssen-owned shipyard Blohm+Voss in Hamburg.

Saab Kockums is a division of the Swedish Saab Group, which in 2018 had a turnover of SEK33.2Bn with 17,096 employees. Kockums employs around 1,200 people, and the company's product portfolio includes naval surface vessels, the national A26 Class submarine programme currently under development, autonomous underwater vehicles, weapons and other naval systems for communication, underwater reconnaissance and protection.

After the acquisition by HDW in Kiel the Swedish shipyard belonged to thyssenkrupp Marine Systems until mid-2014. On 22 July 2014 Thyssen-Krupp Industrial Solutions sold the shipyard to Saab, now known as Saab Kockums. With this industrial policy shift toward more national sovereignty, the Swedish Government expects to retain its submarine construction capabilities in the country, secure foreign markets and enter into international cooperation.

With the construction of aircraft carriers, destroyers, frigates, submarines, patrol boats and support ships, the government-owned Spanish shipyard Navantia has a broad product range in naval shipbuilding. The company, which has around 5,000 employees, has developed the SCORPENE submarine together with the French Naval Group. It was successfully marketed abroad, but neither in Spain nor in France. Navantia is currently building four S80 class submarines for the Spanish Navy.

Need for Political Action

The consolidation of European naval shipbuilding has been pushed into the distant future by an increasingly national industrial policy and the massively state-subsidised arms export policy of numerous countries to support their state-owned enterprises. In order to ensure equal opportunities for German naval shipbuilding run by the private sector and to safeguard our national defence capacities and key technologies, there is still a considerable need for political action to promote international cooperation, negotiate "at eye level" and promote the consolidation of companies in Europe:

1. To step up the creation of European military joint projects as an indispensable prerequisite for international cooperation

and the formation of cross-border joint ventures;

2. Harmonised procedures for the development, procurement and operational approval of military equipment, coordinated throughout Europe and oriented towards NATO standards;
3. To organise competition in the European Union under equal conditions ("level playing field");
4. Harmonisation of European arms export regulations to ensure equal opportunities and the ability of the German defence industrial base to cooperate in international competition,
5. Abolition of the protectionist and competition-distorting offset laws which exist in many countries and which require compensation for defence materiel contracts and thus, particularly in the case of relocation of production shares and licensing, put the German small and medium-sized supplier industry at a considerable disadvantage.

These industrial policy measures will strengthen naval shipbuilding in Europe, enable naval shipbuilding in Germany to successfully meet international challenges and, with its innovative products, expertise and flexibility, remain a strategic partner for the Bundeswehr and the allied armed forces as well as for the foreign naval industry. ■

tkMS: New Orders, €250 Million Investment, 500 New Jobs

(jh) thyssenkrupp Marine Systems, Germany's third-largest defence company and world market leader in conventional submarines, has recorded a positive development: by 2023, the company will invest €250 million at its Kiel location. The objective is to develop the shipyard to an international competence centre for conventional submarine construction. As a result from positive commercial developments and new orders, around 500 new employees will be hired throughout the company by the end of 2020, the majority thereof in Kiel. The company is looking primarily for engineers and skilled workers, particularly in R&D, construction and manufacturing.

thyssenkrupp Marine Systems has recently succeeded against strong competition in the surface combatant sector: In August 2019, the company was contracted by an African customer to build four frigates. The company is in charge of building Germany's most modern naval vessels, the F125 class frigates, the FoC of which was commissioned by the German Navy in June 2019. In May of this year, the first of four state-of-the-art corvettes was christened for the Israeli Navy. In April 2019, Brazil selected the company as preferred bidder for the production of four corvettes. In Germany, thyssenkrupp Marine Systems is involved in the construction of the 2nd batch of K130 corvettes.

During the first few months of this year, thyssenkrupp Marine Systems christened the largest conventional submarine ever built in Germany for Singapore and the third of four submarines for Egypt. With the 212CD project for building a total of six identical submarines for Norway and Germany, thyssenkrupp Marine Systems, together with its customers and partners, intends to create the European NATO standard of the future in the field of conventional submarines. Already today, 70 percent of NATO's conventional submarine fleet is produced by thyssenkrupp Marine Systems.



“The chemical defence standards defined in the NATO triptych are outdated”



Photo: Peter Bossdorf

Proengin is a leader in chemical and biological detection thanks to its flame spectrometry technology that ensures fast and reliable detection. Today, more than 70 countries rely on Proengin for chemical and biological protection, from small handheld AP4C detectors to vehicle- and building- mounted AP4C-V and AP4C-F detectors. ESD spoke with Eric Damiens, Vice-President Marketing & Sales at Proengin.

ESD: What kind of chemical and biological threats do troops have to be aware of in theatres of operation?

Damiens: There was a time when a chemical war was to take place against the armies of the Warsaw Pact along the Elbe and the list of chemical warfare agents was limited to four or five gases. At that time, the biological threat was purely theoretical.

This scenario is obviously outdated and a chemical attack can take place anywhere, can take place without weapons and may involve toxic products of industrial origin. In recent years we have also had to learn the term PBA: Pharmaceutical active ingredients. The chemical defence standards defined in the NATO triptych are therefore outdated.

There are no more CWA detectors, only chemical detectors. I think the term CWA is obsolete.

ESD: What capability portfolio does Proengin offer to military and civilian customers?

Damiens: CBRN threat management is what we want to offer to our customers. A simple chemical or bio alarm is not enough. Sharing Information and raw data, situation awareness, assistance to decision-makers are key in threat management. Next to our traditional hand-held, vehicle-mounted or 24/7 operation detectors, we

offer a range of services that allow the user to be informed about the situation and how to proceed so they can decide what to do.

Nowadays, military and civilian customers are exposed to similar threats, but have different ways of responding to them. We need to adapt our systems to different user groups.

ESD: All of your chemical detection devices are based on flame spectrometry technology. Can you briefly elaborate on this technology?

Damiens: The science of flame spectrometry is very simple. Burning an element will emit a light. The wavelength of the light is specific to the atoms that are burned. Astronomy has been using that science for ages to determine the types of gases they find in stars. We are doing the same in our detectors. The real know-how of Proengin has been our capacity to use that science to find several gases simultaneously and at very low concentrations.

We have chosen to detect phosphorus, sulphur, arsenic and the chemical liaison HNO for chemical detection and potassium and sodium for biological detection. It enables us to be able to detect thousands of gases without having to upgrade any library. This is why our AP4C product range can detect any Novichok agent without any

upgrade as we detect phosphorus inside all the Novichok molecules. Anyone who has purchased an AP4C 10 years ago, can detect Novichok and Fentanyl today.

ESD: What are the particular challenges when detecting biological agents? How do you deal with them? What technologies do these threats implement?

Damiens: The concept of biological detection is quite complex. There is no physical technology allowing to differentiate a non-pathogenic bacteria from a pathogenic bacteria. Only bio processes such as immuno-assay process, PCR or DNA analysis can do that. It takes time and it requires a sample. It is therefore impossible to do a continuous monitoring of an area.

Technologies such as flame spectrometry are there to tell the user when he should take a sample and make a test. However, the main challenge is to reduce the cost of this operation. Our AP4C-VB is a big step in this direction as we are able to use only one sensor to simultaneously perform chemical and biological detection.

ESD: Reliable performance and a superior durability are basic requirements for CBRN response equipment. How do you ensure that your products meet these requirements and how do your devices perform in this regard?

Photo: Proengin



Proengin's AP4C is a portable chemical contamination control device used to detect chemical agents in the form of vapour, aerosols and dust; and liquids with the S4PE.

Damiens: There are two factors allowing our detectors to reach this high degree of reliability and durability: Flame spectrometry is a simple science and does not require complex assemblies of many high tech elements. Our know-how is much more in the process, the settings and the algorithms than in the parts themselves. Proengin is not a manufacturer of lab equipment trying to adapt their products to a military field use. From the first sketch, our products are designed to be used in harsh field conditions.

Proengin has designed military field products since 35 years and this experience is recognised by our users.

ESD: Proengin devices are in use in many countries. What markets / regions do you focus on?

Damiens: Proengin has always been active on the global market and our detectors are in service in 70 countries on all continents. We are opening markets in new countries every year. This year we had our first contract in Uzbekistan and our sales in GCC

countries have jumped. Besides our traditional markets Australia, the US and India, we have just signed a record contract in our own country, France. However, our expansion will be based not only on a geographic expansion but on new markets like critical infrastructures, vehicles and Navy Ships in countries where we have already users.

ESD: How much does Proengin invest in R&D? What are the R&D priorities of your company? Do you cooperate with scientific institutions?

Damiens: Proengin was born as a R&D company in the seventies. Our first serial product was launched only in the 1990s. At least one third of our staff is working in the R&D department. We are obviously focussing on improving flame spectrometry technology that is the core of the company, but we are also working on the ergonomics of the detector and connectivity technologies that we develop with partners. Usually, we use our own money to fund R&D to remain independent but we are cooperating with prestigious scientific institutions such as TNO and FOI to exchange information and to perform specific testing.

This interview was conducted by Peter Bossdorf.

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Partner of NATO – Heckler & Koch Turns 70

Jan-P. Weisswange

For 70 years the small arms company Heckler&Koch, based in Oberndorf am Neckar, has been supporting the armed forces and security forces of Germany, NATO and NATO-associated countries. This traditional German company - also known as "HK" - enjoys a legendary reputation worldwide.

Heckler & Koch was founded on 28 December 1949. The company founders were Edmund Heckler (1906 - 1960), Theodor Koch (1905 - 1976) and Alex Seidel (1909 - 1989). From the very beginning, Heckler & Koch was characterised by a high level of engineering and weapons expertise, as well as by the proverbial Swabian inventive and entrepreneurial spirit. All three company founders had started their professional careers in the famous Mauser factories in Oberndorf. Heckler & Koch is still based in the town known for its metal-working industry and weapons forge.

Photo: HK



The HK headquarters in Oberndorf has state-of-the-art infrastructure and machinery

An Exciting History

Heckler & Koch initially produced spare parts for sewing machines and bicycles, but received early permission from the French occupation authorities to manufacture small arms. First customers were the police, the German border police and the allied armed forces. With the rearmament of Germany in 1955, HK turned into an arms factory. From 1959 on, the company was the main supplier of the G3 assault rifle for the German armed forces. In the mid-sixties, the MP5 submachine gun was a second major success based on the reliable roller-delayed blowback mechanism known from the G3. The MP5 achieved worldwide success after the British SAS ended the hostage situation in the Iranian embassy on Prince's Gate in London in 1980 – better known as Operation NIMROD.

During the Cold War, HK, together with Hensoldt and Dynamit Nobel, developed

the G11 caseless ammunition assault rifle on behalf of the Bundeswehr. When the Cold War ended, however, the order was terminated which spelled financial difficulties for the company. In 1991, HK became part of Royal Ordnance, a subsidiary of the British BAE Systems. During this time, HK received large orders: From 1997 HK supplied the Bundeswehr with the G36 assault rifle and the P8 pistol. In addition, the company revised the British standard weapon SA80/L85 which was originally developed by Enfield. In 2002, the private investors Andreas Heesch and Keith Halsey took over Heckler & Koch. The investors reorganised the company and realigned HK to an internationally operating defence company headquartered in Oberndorf. The product portfolio was diversified, sales were internationalised, and substantial investments were made in the headquarters and production site in Ober-

dorf. Infrastructure and machinery were modernised. A new, expanded logistics centre was built in 2007. Heckler & Koch has also had a new training centre since 2010.

HK Today

Today, the H&K AG Group includes the subsidiaries Heckler & Koch GmbH and Heckler & Koch Management GmbH (both located in Oberndorf), Heckler & Koch France S.A.S. in Saint-Nom-La-Bretèche/France, Nottingham Small Arms Factory Limited in Nottingham/UK, as well as Heckler & Koch, Inc.(Columbus/Georgia), Heckler & Koch Defense Inc. (Ashburn/Virginia) and Small Arms Group Holding Inc. (Ashburn/Virginia). The corporate headquarters is located in Oberndorf am Neckar. Since 2018, Jens Bodo Koch has been CEO of the company. By the way, Koch is not related to the com-

Author

Jan-P. Weisswange PhD is a communications manager in the defence industry. This article reflects his personal opinion.



Photo: Bundeswehr

The MG5 (alias HK121) is the standard MG of the German armed forces.

pany founder Theodor Koch. Björn Krönert holds the position of CFO.

Heckler & Koch maintains extensive research and development capacities in order to be able to meet the constantly evolving demands of the armed forces worldwide. Within the framework of its own projects and on behalf of the German government and other NATO countries, HK is a market leader in developing weapons and weapon systems and in improving existing ones.

Heckler & Koch's strictest internal compliance and security rules are a cornerstone of the business model. Key components are produced exclusively in Oberndorf, even if licences are granted. The company and its quality assurance system are certified to EN ISO 9001 and meet the requirements of NATO's quality standard AQAP 2110.

Family Idea

Already during the Cold War it was one of the strengths of the Oberndorf armourers to think in families. The G3 assault rifle was surrounded by a whole family of weapons, ranging from submachine guns to belt-fed light machine guns. The reliable short-stroke gas piston system of the G36 not only made the Enfield SA80 a field-ready assault rifle, but also laid the foundation for the successful HK416/417 assault rifle family.

Despite different manufacturing processes, the MG4 and HK121/MG5 machine guns are also distinguished by their similarity. In the German armed forces, the MG5 is currently replacing the MG3 as the standard universal machine gun, while the MG4 and MG5 inventories are being further harmonised.

The HK Number Key

HK has developed a two-digit number key with the weapon family around the roller-delayed blowback mechanism. The first digit indicates the type of weapon, the second the calibre. Since the beginning of this millennium, a three-digit numerical code has been introduced – independent of marketing names such as 416 or 417. The first digit stands for the generation, currently 1 - 4. The middle digit now stands for the type of weapon, namely 1 for magazine-fed MG, 2 for belt-fed MG, 3 for assault rifle, 4 for semi-automatic rifle, 5 for submachine gun and 6 for grenade launcher. The third digit indicates the calibre: 1 stands for 7.62mm x 51, 2 for 7.62mm x 39, 3 for 5.56mm x 45, 4 for 9mm x 19, 7 for special calibres and 9 for 40mm x 46. According to the new nomenclature, a G36 is called HK133, a HK417 is called 331 and the MG5 trades under HK121. The products of the old weapon family such as G3 (HK31) G8 (HK21) or MP5 (HK54) would carry according to the new nomenclature a "0" in the first place, whereby that number is not written out.

In the field of pistols, a complete product range based on the STRIKER Fire Pistol 9mm x 19 was recently developed; several German state police forces have fielded the SFP9 as the new service pistol.

The HK416/417 Small Arms Family

The development of the HK 416/417 family began in the beginning of this millennium. It combines the battle proven operating concept of Eugene Stoner's AR assault rifle architecture with the legendary short-stroke gas piston system of the G36. Series production of the HK416 and the "bigger brother" HK417 in calibre 7.62mm x 51 started in February 2005. First procurements quickly followed. One of the first customers was US SOCOM, followed by Special Forces from France, Great Britain, the Netherlands, Poland, the Czech Republic and Germany.

The first major order was received in 2007. The Norwegian armed forces procured the HK416 as their new standard assault rifle. Another major success overseas came in 2010 when the US Marine Corps replaced a portion of its M249 light machine guns with the 16.5-inch barrel version of the HK416 as the Infantry Automatic Rifle M27 with the intention to enhance the automatic rifleman's manoeuvrability. In September 2016, the French procurement authority Direction Générale d'Armement (DGA) ordered the HK416 assault rifle system as the new standard French handgun "Arme Individual Future (AIF)".

The weapon family also gained a foothold in Germany. The HK417 is used by the Bundeswehr as the G27, the HK416A5 by various security authorities as the G38 and the German special forces selected the A7 version of the HK416 as the G95K. The most recent successes of the 416/417 family can be seen in the US. In July 2019, the US Army announced the acquisition of several thousand semi-automatic G28Es as M110A1 Semi-Automatic Designated Marksman Rifles.

The HK416, together with the newly developed HK433 modular assault rifle system, is currently reportedly in the race for the new Bundeswehr assault rifle system.

Outlook

Especially with regard to national and alliance defence, the development, production and sustainable technological support of handgun systems represent key technologies. In this particular field Heckler & Koch is one of the European global players with worldwide success. ■

“The law enforcement market is very important to us”



Photo: ACS

ESD: ACS is best known for its Light Armoured Patrol Vehicle ENOK, of which the German Armed Forces have 250 in service in different versions. Which other military programmes are you working on? Are you looking at the future air-transportable wheeled platform for the German Army, or at certain export projects?

Paeske: ACS is the specialist for protected and special vehicles in sensitive weight ranges, especially the class up to 10 tonnes gross vehicle weight. So wherever high tactical mobility in connection with air transportability as internal or external load is required, our vehicles are strong candidates.

Next to the known variants of the ENOK we offer a Special Operations Vehicle (SOV) based on the combat proven ENOK chassis. The open passenger cabin can be modularly adapted for two to six fully equipped soldiers. The modular concept of the vehicle also allows a mission related stowage of the equipment. The ENOK SOV offers ballistic and mine protection. The vehicle was designed as an open crew cabin, but it can be quickly closed completely with little effort thanks to a tarpaulin cover and modular doors. This system allows protection against all weather conditions, and the doors also allow complete ballistic protection from the side.

ESD: With the military being your main customer, how important is the law enforcement market for ACS?

Paeske: The law enforcement market is very important to us. It is a fact that the demand

ACS Armoured Car Systems markets protection solutions for civil, police and military use and is a leading developer of protected vehicles, of which ENOK is the best known. ESD had the opportunity to talk to Tanja Paeske, Member of the Executive Board at ACS.

for offensive vehicles for the Special Operation Forces (SOF) of both the military and police is increasing worldwide, and in my view the ENOK meets the needs of the users best. This is the reason why different police units like the German Federal Police and the Finnish Police already have the ENOK 5.4 and ENOK 6.2 in service. ACS is adapting the vehicles individually according to their needs. Thanks to their modularity, they can be quickly changed for different scenarios or mission challenges, in terms of protection, armament, storage space concept or number of seats.

ESD: Military and police operations, however, place different demands on a vehicle. Is it difficult to adapt, and where are the synergies – and potential added benefits – for the police customer?

Paeske: Of course, vehicles suited for the law enforcement market have to meet a couple of specific requirements. First of all, they must be suited for urban environments; they need to be agile, small and well manoeuvrable even in narrow streets. At the same time, they must retain their off-road capabilities, with extended ground clearance, wading depth and good performance on unpaved roads, and be able to overcome obstacles in the city, for example stairs. Like military vehicles, they must meet high security requirements, such as protection against ballistic threats like Kalashnikov fire, blast, and the intrusion of gas. And finally, flexible equipment options are important: weapon stations, windows with gun ports, and other armament options, sufficient stowage, and so on.

As a proven, highly protected, and very compact off-road vehicle, the ENOK meets all those requirements: One of the main features of the ENOK is its agility. In relation to the vehicle size it offers a very high protection class, generous space with high payload, and a low vehicle signature. It still has high off-road capabilities, and can be fitted for an offensive role, including

equipment with weapon station and gun mounts. In short: It offers the best possible balance between outstanding mobility, payload, and a high level of protection. And on top of that, through-life support and the availability of spares are guaranteed by the global network of licenced Mercedes dealers.

ESD: Your third business line are civil vehicles fitted with discreet armour. Can you tell us a bit about your activities in this field?

Paeske: Triggered by the 2016 shooting in Munich's Olympia Shopping Mall, we developed concepts for the protection of patrol vehicles. Such special operations show: the



Photo: ACS

The armoured LAPV 5.4 designed by ACS

first forces on site are usually patrol officers. They have the situational awareness until special forces move up, but their equipment is limited. Our concept is based on protection kits with protection Level NIJ-III A or VR4 as upgrade solution for existing vehicles. The advantage is a high degree of protection, the OEM status of existing vehicles is maintained, there is no intervention necessary in the vehicle's electrical/electronic system, and after all, the protection kit can be retrofitted at the end of its service life.

This interview was conducted by Andreas Himmelsbach.

19th NATO Days in Ostrava

Michał Jarocki

The NATO Days and Czech Air Force Days, which were held at the Leos Janacek Airport in Ostrava, are one of the biggest defence and security shows in Europe. According to the motto, “Our security cannot be taken for granted and there is no prosperity without security”, the event is always expected to present a wide array of weapon systems and capabilities of the Czech and allied armed forces, which lays the ground for stabilising and strengthening the security system on the continent.

The rich programme of the event included presentations and demonstrations of various weapon systems, such as fighter, trainer and transport aircraft, helicopters and bombers, main battle tanks, infantry fighting vehicles and armoured tactical platforms, in addition to small arms and personal equipment of soldiers and Special Forces operators, as well as firefighters, policemen, customs officers, the prison service and municipal police.

The 19th edition of NATO Days in Ostrava welcomed over 220,000 visitors, including professionals and representatives of the media, who could follow 70 dynamic and static displays showcased by 17 participating countries, including Romania, which was the Special Partner Nation of this year’s edition of the show. The Romanian Air Force, Army, and Department for Emergency Situations presented a number of air platforms from its inventory, such as MiG-21 fighter jets, the IAR 99 ȘOIM advanced trainer and light attack aircraft, the IAR 330 PUMA multirole helicopter as well as C-27J SPARTAN transport aircraft.

Among other participants were Austria, Canada, Czech Republic, Finland, France, Germany, Hungary, Italy, Lithuania, Netherlands, Norway, Poland, Slovakia, Switzerland, the UK and the US as well as NATO’s E-3A Component with all-Polish crew.

US Air Force Capabilities on Focus

The US Air Force (USAF), as one of the major participants of NATO Days in Ostrava, underlined the fact that the event increased US

Author

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

Photo: Michał Jarocki



Romania, as the Special Partner Nation of this year’s NATO Days, presented the locally manufactured IAR 330 PUMA multirole helicopter.

capabilities in cooperation with partner nations and demonstrated integrated, proven and effective training system of allied forces, improving the security system in Europe.

According to Maj. Gen. John B. Williams, Air Force Reserve Mobilization Assistance to the Commander, USAF-AFRICA, the US presence in Ostrava was “to show our support for the [NATO] alliance. (...) It is all about our partners. It is important for us to show our support, all of our aircraft ready to together represent the alliance. We stand together for the common good”. The USAF was represented by a number of aircraft and aircrew from Air National Guard, Air Force Reserve, and active-duty units. The platforms showcased during the show included one MQ-9 REAPER assigned to the 52nd Expeditionary Operations Group Detachment 2 in Miroslawiec, Poland, one B-52 STRATOFORTRESS from the 307th Bomb Wing at Barksdale AFB, La., one KC-135 from the 155th Air Refueling Wing, Nebraska ANG and one C-5M Super Galaxy from the 433th Airlift Wing, Joint Base San Antonio-Lackland, Texas.

“We came out to build camaraderie with our NATO partners; we’re getting a chance to meet and exchange information we might not have had prior to this NATO Day event”, said Capt. David Fink, 68th Airlift Squadron C-5M Super Galaxy pilot, Joint Base San Antonio-Lackland, Texas.

Bell Enhances Sales Opportunities

The American company Bell was one of the most important representatives of the aviation and defence industry present in Ostrava. The manufacturer showcased its AH-1Z VIPER attack and UH-1Y VENOM multirole helicopters, assigned to the US Marine Corps. These platforms make up for Bell’s sales offer for most of the Central and Eastern Europe countries and all other states in the so-called Three Seas region. The manufacturer came to Ostrava shortly after the Czech Republic decided to procure four AH-1Z VIPER attack and eight UH-1Y VENOM utility/multirole helicopters to modernise the country’s armed forces and

enhance their operational capabilities. “We reviewed the offers received, and based on military recommendations, we decided on a variant that includes eight UH-1Y VENOM multi-purpose and four AH-1Z VIPER attack helicopters. We would like to conclude the contract by the end of the year”, said Lubomír Metnar, head of the Czech MoD in August 2019, shortly after the decision to acquire Bell’s helicopters was announced. “This is something we have worked on for over 5 years. We were here in 2014 and we explained the value proposition of having a combat multirole, UH-1Y and a dedicated attack, the AH-1Z, flying and operating them together”, said Joel Best, Director of Global Sales and Strategy at Bell during the show in Ostrava.

According to the Czech authorities, deliveries of new rotary-wing aircraft should commence in 2023. However, despite the significant involvement of the local industry, the manufacturer denies the possibility of transferring the technology directly to the Czech Republic. “Because there’s 12 aircraft, there is not going to be any co-build of the aircraft. However, the integrators for the maintenance, repair, overhaul come to the US to help build the aircraft”, said Best. Best underlined the fact that the Czech VIPER/VENOM helicopters will have a similar standard to the ones which are operated by the US Marine Corps. “They’re essentially buying the Marine Corps variant and will stay on the growth path with the USMC. There will be some minor modifications. They want a weather radar. They have very minimum integration requirements”, said Best.

The manufacturer also acknowledges that the number of platforms that the Czech Republic is buying is insufficient to satisfy the requirements of the country’s armed forces. Therefore, Bell is looking forward to receiving more orders in the future.



Photo: Michal Jarocek

BAE SYSTEMS presented its CV90 infantry fighting vehicle, which is a contender in the Czech Army’s tender for over 200 such platforms.

Bell is also positive about sales perspectives in other CEE region countries, such as Poland or Romania. “We believe that there are capabilities and elements across most of the V4 countries”, said Best. Poland has a requirement of several dozen modern combat helicopters under the KRUK programme in order to replace its Soviet-era Mi-24D/W aircraft. Similarly, Romania is looking to procure a number of attack/multirole helicopters and Bucharest has already sent a Letter of Request to the US DoD in 2017 regarding the potential sale of Bell aircraft.

The Czechs’ New Trainer Jet

During NATO Days in Ostrava, the largest Czech aviation manufacturer revealed a handful of new facts about the ongoing development of the L-39NG next generation advanced trainer jet and light attack aircraft. The company confirmed that the project is running on schedule and that the fully capable platform will be delivered in the coming years.

“We are on track. We have one flying prototype. The second prototype will enter

flight tests in October. We are very well on time”, said Dieter John, President & CEO of Aero Vodochody Aerospace. “We offer three configurations: the basic trainer, the advanced trainer and light attack version”, he added.

The manufacturer plans to use three aircraft in the development, testing and certification process of the L-39NG platform. The first one, a L-39CW technology demonstrator, commenced flight testing in March 2019, which subsequently was proceeded by intensive avionic, stall, and spin testing. The first prototype of the L-39NG initiated a pilot static and basic performance testing in September, while the second platform is expected to start flight tests by the end of 2019. Dieter John added that all three flying test aircraft shall complete full L-39NG flight test campaign in summer 2020. Certification of the full trainer and light attack configuration should be finished by the end of 2021.

The manufacturer also referred to export plans and sales opportunities of the L-39NG platform, confirming that a number of potential buyers have already been identified, such as the Czech Republic, Slovakia, Lithuania, Austria, Hungary, Greece, Senegal, Thailand, Philippines, and Vietnam.

It has already been confirmed that the Slovak Air Force is looking for a number of advanced trainer jet to train a new generation of pilots, who in the next years will start operating a fleet of 14 F-16V Block 70/72 multirole fighter aircraft, which the government in Bratislava contracted late last year. It has not yet been announced what requirements will be sent out to potential bidders; the Slovak MoD is still working on that issue. However, the new aircraft will replace the currently operated, legacy trainers, including five L-39CM and two L-39ZAM, at these platforms are said to be incapable of offering the level of training required to prepare pilots to operate the future F-16s. ■



Photo: Aero Vodochody Aerospace

L-39NG, the Czechs’ next generation advanced trainer jet and light attack aircraft, during the first flight

“We can train any small arms”

Photos: Meggitt Training Systems



Johnathan Ayala

Meggitt Training Systems is a leading supplier of integrated live fire and simulation weapons training systems for defence forces, law enforcement agencies and commercial shooting range owners around the world. At the AUSA Annual Meeting & Exposition, ESD had the opportunity to talk to Johnathan Ayala, Virtual Systems Sales Manager, and Jon Read, Director Live Fire Sales & Programs at Meggitt Training Systems.



Jon Read

ESD: Meggitt Training Systems comprises the two brands Caswell and FATS. How is your work shared between these two entities?

Ayala: We are 50:50. We work hand in hand every day with FATS virtual systems and live fire ranges serving the same customers, such as the allied military forces, law enforcement and commercial shooting range owners. We provide both sides of their training, simulation and live fire, as they all go hand in hand. Typically, Meggitt’s virtual training is presented first to get the trainees up to speed. Then they move on to live fire training using real ammunition.

ESD: Is there a tendency for simulation to replace the live fire training, or is this still really just a complement?

Ayala: Virtual systems complement live fire training. It’s typically about cost savings on the front end with simulation, saving the customer time, logistics, and the cost of ammunition. That’s the goal. Meggitt Training Systems increases the students’ marksmanship proficiency with virtual technology. Once they’re qualified on the virtual system, the trainee moves on to live-fire training. That’s where the rubber meets the road.

ESD: So there has not been a shift towards more simulation during the recent years?

Ayala: When FATS first introduced virtual weapons training to the world in 1984, it was a huge deal. We’ve seen ups and downs over the years, but recently it has

spiked up again with the advancing technologies. And with everybody leaning towards virtual training as a measurable cost savings, it has definitely picked up. Plus with the FATS systems, you can perform after action reviews on the trainees to see their weapon trace, cant, butt pressure and so much more. The diagnostics you get on a virtual system provide invaluable information to the trainer, allowing them to help the recruit so much more than before.

ESD: To go back a bit in this history, the Meggitt group serves a broad range of rather diverse markets, and traditionally military training was none of them. Why was the decision taken to expand into that field?

Read: As I stated earlier, FATS introduced virtual weapons training to the world in 1984, with the primary customer being law enforcement. After the military saw the innovation and technological advancements of the system, they decided to move their training to simulation as a starting point. Obviously, the synergies with Meggitt’s other defence activities helped us reach this market.

ESD: Does that mean Training Systems cooperates a lot with the Defence Systems (MDSI) division within the Meggitt group?

Read: On the live fire side, Meggitt Defence Systems has some radar scoring systems they use for aircraft scoring and we do partner internationally with them to work on existing live fire ranges and new products. So we do work together with MDSI

from the targetry scoring perspective. We have the radar scoring, the infantry scoring, and the armour scoring. All three of those products really fit well together on the large live fire multipurpose ranges.

ESD: Let us stay on the live fire side for a moment. Showcasing a Stationary Infantry Target (SIT) at AUSA at first glance does not look too exciting. So what are its peculiar features?

Read: Yes, it is pretty utilitarian from the perspective of “it goes up and down, it turns side to side”. But it has to be robust, it has to last. There is a requirement with the US Army that we have to sustain that product for twenty plus years. So it is a robust product, it is IP 67, and what makes our product unique compared to other products is that ours is fully compatible with existing ranges with equipment on them that may be 10 or 15 years old. We can actually take our new generation targetry and add that in to supplement these old ranges. Because they can all work in concert together. So this is an advantage for Meggitt Training Systems.

ESD: And you have the LOMAH (Location of Miss and Hit) system. Is this an integral part of the SIT, or is it a modular design?

Read: It is definitely modular. You can add it or subtract it. It actually can stand alone without the SITs. But it scores any small arms projectiles that are travelling faster than the speed of sound. You can shoot these at a thousand, two thousand metres, as long as the velocity of the round is supersonic. And that scoring system is accurate up to 5 millimetres.

And it gives an instant feedback on the student station, so wherever the shooters are shooting from, they will have a display that will give them immediate results of that round once it crosses over the sensor, so they can make adjustments to whether it is their optics or the way they are shooting or the trigger squeeze, whatever it may be, to be more accurate.

ESD: On the simulator side you are presenting the FATS 100MIL. Can you tell us a few words about that and its specific characteristics?

Ayala: It is related to programmes of records for the US Army and the US Marine Corps. They use our simulators for their qualification and practices in basic and advanced marksmanship. The FATS 100MIL is our COTS system for other militaries that also want to train on simulator systems. We use our patented BLUEFIRE weapons that communicate wirelessly with the FATS system. The BLUEFIRE weapon knows when you load the magazine, and when you load a round in the chamber. When you fire all the rounds out, it will lock back to the rear, causing the student to handle the weapon exactly like they would a live fire weapon, but now in a virtual environment. So now the student can practice everything with ballistics included into it, and accurately on a simulator. We also have a portable virtual system that you can literally pack up and move, set up in a classroom in 15 minutes, train your soldiers, and pack it up again. This is ideal if the framework is not there, because you do not have to build a specific room for it. You can of course permanently mount it if you wish. We can train any small arms: pistols, rifles, machine guns, rocket launchers, even mortar systems. This is really



With the FATS systems, trainers can perform after action reviews to see the trainees' weapon trace.

important, because mortars are very expensive. You have a 30-man mortar team, and each live shot for example here in the US costs US\$250, times thirty. So you are only going to give each person one shot, that is it, and they cannot learn from it, because they need multiple repetitions. We can replicate all that, which means cost savings for every user around the world, that is where they benefit.

ESD: So the BLUEFIRE system can be attached to live weapons or how does it work?

Ayala: It is integral. What we do is we take apart a live fire weapon and permanently modify the insides to utilise our proprietary BLUEFIRE sensors, pneumatics, and laser to communicate with the system. And we can integrate almost every weapon system. We have 300 BLUEFIRE weapon variants available today.

ESD: Speaking about the overall market for training systems again: You won a big contract for the US armed forces. Where are your other core markets?

Ayala: It is very broad, because we have the main large military forces, smaller military units which have their own funds, and law enforcement. Our customers are the UK MoD, Canada, Italy, Belgium, Singapore, the UAE, Australian Defence Forces, and in South America with Paraguay, Chile, Brazil, Argentina and Mexico.

Read: For live fire we have made good successes in Europe this year with Lithuania and Latvia. We are going to do a demo with the German Army soon, and we are building systems now for the UK MoD. In Morocco we are installing a very large outdoor military training facility. Of course, in the Middle East we are probably the number one supplier for live fire indoor and outdoor ranges.

ESD: A final question: With the level of technology achieved today, what is still to be expected for the future?

Ayala: The virtual market is looking at the transition into virtual reality (VR). And it is always about quality. You can have a lot of similar products, but obviously the one with the best quality is the superior product. We at Meggitt Training Systems, as the leader in live fire and simulation training around the world, are also leaders in innovation, and we want to continue that. So if the next step is VR, we definitely will be going forward there.

Read: In the live fire arena, today we have unmanned aircraft, drones, and robotic autonomous "soldiers", and targets. I have heard from several officers in the Army that they are going to start transitioning the existing infantry ranges to more robot-type training. Autonomous or robotic targets that are controlled from a distance for me is probably the future for live fire. That is ten or fifteen years from now, but with the technology advancements of robots and autonomy, it is right in front of us.



Meggitt's LOMAH (Location of Miss and Hit) system gives instant feedback at the student station; shooters receive immediate results.

The interview was conducted by Andreas Himmelsbach.

Russia's Military Aviation Industry

Eugene Kogan

The Russian military aviation industry largely depends on a balance of domestic orders and exports providing the companies with a medium and long-term perspective.

Although the full scope of the State Armaments Programme (Gosudarstvennaya Programma Vooruzheniya – GPV) 2018-25 published in May 2017 is unknown, it continues to focus on the procurement of fighter aircraft such as the Su-30SM, Su-34, Su-35, as well as orders for the new Su-57 fighter and MiG-35. De-

velopment of a new long-range bomber is also expected while the production of the Tu-160 has been re-launched. The maiden flight of the Il-112V military transporter took place in March 2019 and the upgrade of the Tu-22M3s to the new Tu-22M3M standard with new engines and weapons is ongoing. Exporting combat aircraft abroad is a Russian priority not only because of foreign exchange payments, but also because it ties foreign customers to Russia for decades to come through the training of foreign pilots, after-sales support, creation of

a joint MRO, technology transfer (ToT) and know-how, counter-trade programmes, a compensation package, low-interest loans and financial assistance. These are just few of the Russian offers that come along with the sale of fighter jets. Openly available information about combat aircraft exports make Russian top managers proud. At the

Altogether, lack of financial transparency pushes researchers back to the era of the former Soviet Union, when financial data was not disclosed. The financial data for military aviation companies in 2018 was not published yet. Thus, it would be interesting to see the results of the aforementioned concealment law. Still, it is possible to discern what is happening within the aviation industry and provide incomplete financial data.

Consolidation of the Industry

Even though the article focuses on the current state of military aviation industry it is impossible to ignore the civil side of the same industry. Despite many challenges it faces and a low output civil aviation industry, it did not fall apart, and continues to be supported by the Russian government. In addition, it remains an integral part of the consolidation process presented below. The decision was made in late 2016 to consolidate the entire aviation industry and plans related to its consolidation were finally given a green light on 24 October 2018. President Putin signed an order on that day authorising the incorporation of United Aircraft Corporation (UAC) into the State Corporation Rostec (Rostec). The order states that: "The Russian government's proposal for the transfer to the State Corporation Rostec, of the government's holding of 92.31% of shares of UAC." According to the order, the transfer is to be completed within 18 months (from the signature of the order) and thus effectively puts the aircraft industry into Rostec's hands. As we will see further below Rostec proved to be very successful corporation despite having about 700 companies, enterprises and research institutes under its umbrella and despite being blacklisted by the United States since March 2014. Therefore, neither the size of the corporation nor the fact that it is blacklisted has damaged the reputation of Rostec. But the truth might be the opposite. Previous plans regarding consolidation of the entire aviation industry and, subsequent creation of four divisions that were broadly discussed in the open press, were nixed by

Photo: Katsuhiko Tokunaga



A SCACIAlenia Aermacchi Sukhoi SUPERJET 100 (RA-97004) flying off the coast of Italy near San Remo. The Sukhoi SUPERJET 100 is the first airliner to be developed under the UAC brand, since Sukhoi Civil Aircraft is a branch of the corporation.

same time, however, a new law shows that some government officials want to return to the old days of concealing financial data.

Hiding the Balance Sheet

Although the full scope of the GPV is unknown, the Russian decision of 20 December 2017 to hide information about companies and individuals hampers research on the Russian aerospace and defense industry and, in particular, the financial data of the industry. The law was signed by President Vladimir Putin in December 2017 and aims to conceal financial transactions of state defense companies. In particular, the new law allows shareholding companies to not disclose financial information in certain circumstances, as well as limiting information about certain individuals on the internet.

Author

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

Sergei Chemezov, CEO of Rostec. Chemezov said in February 2019 that: "UAC is to have two divisions: military technologies and civilian products." Besides, it is too early to comment on personal changes within consolidated UAC. Earlier announcements related to the personal changes should be taken with precaution. Chemezov added that: "Rostec plans to bring private investors into second division", since this division requires urgent financial investments. Chemezov was critical of the UAC financial situation in general and its civil aviation segment in particular. He said that: "UAC requires extra funds." Chemezov criticism should come as no surprise since over the last two decades officials within civil aviation segment spoke about grandeur that proved to be a pipe dream. Russian officials claim that country's civil aircraft can compete on par with Airbus and Boeing failed to materialise. In part because of subsidies that Russian government provides for, and in part because of lack of new technologies and lack of healthy competition of the Russian civilian air carriers on the international market. Due to the domestic orders and international sales of military aircraft the aviation industry remained competitive and prosperous over the last two decades.



Photo: Kremlin

During a videoconference with Russian Aircraft Corporation MiG in 2017, Vladimir Putin was briefed on the start of flight tests of the new multipurpose MiG-35 fighter.

Thus, making commercial liners competitive on the international market is likely to be the goal of the future head of the civil products division. This is an uphill battle because even companies such as Bombardier and Embraer are a great way off from

Russian civil craft manufacturers. The latter have a long way to go to catch up with the four aforementioned companies. For instance, according to the Sukhoi Civil Aircraft Company's (SCAC) financial report, manufacturer of SSJ100 regional airliner,



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The Irkut MC-21 is a single-aisle twinjet airliner, developed by the Yakovlev Design Bureau and produced by UAC. Its name translates as "mainline aircraft of the 21st century".

avionics, radio electronic countermeasures and weapon systems), and the helicopter manufacturer Russian Helicopters is also a Rostec subsidiary. Some managers in the aviation industry believe that UAC would benefit from changes in the management structure, as decisions would be taken by the Rostec board, rendering the protracted inter-departmental negotiations required within the UAC superfluous. The merger would also simplify certification procedures. Therefore, consolidating the Russian aerospace industry might help to wipe out cumbersome practices. To streamline inefficient processes and reduce costs, UAC plans to cut management layers and centralise functions. The consolidated aviation industry would be more resilient against economic sanctions imposed on Russia by the West.

Consolidation would create a large aerospace cluster with a revenue of US\$15.27Bn, and it would help fund UAC's large commercial projects which are currently too expensive and continue to drain funds. Chemezov commented on Putin's decree and said that "this is a crucial moment for the aviation industry", as "the step involves the creation of a national aircraft company – the largest in Russia". In addition to the internal consolidation of UAC, namely the merger of MiG and Sukhoi into the military technology division within UAC, Russian Helicopters would now also join the same division. It is also important to remember that after the merger, Rostec would control the aviation industry's entire export output, as Rosoboronexport, which is responsible for concluding arms deals, is already part of Rostec. Not everyone in Russia is convinced that consolidating the industry under the Rostec umbrella is the right move because the too big to fail formula means that the government will always come in to support the industry.

Why Rostec?

Rostec not only owns a large share of UAC but it successfully manages about 700 companies, enterprises and research

urgent need of successful managers, increased sales and steady income while the professional technical and engineering staff needs to be retained and rejuvenated. Rostec seems to be the answer to these needs since financial data indicates that Russia's aviation industry needs a shake-up with a clearly outlined strategy for putting domestically-produced civilian aircraft on the international market.

The Financial State of the Industry

The UAC revenues reached RUB417Bn, of which 80% was accounted for by the sale of military aircraft. At the same time, the company's loss in 2016 was RUB4.5Bn. Under International Accounting Standards (IAS), the company turned in a loss of RUB6.6Bn (US\$114M) in the first half of 2017 – an improvement over the previous figure of RUB7.3Bn – after increasing revenues by 51% to just under RUB180Bn in 2017. According to UAC's annual financial data, revenues amounted to RUB451.8Bn, with a net profit of RUB21.6Bn in 2017. Nonetheless, sales of the company's civil flagship aircraft SJS100 fell short of the forecast 70. 34 craft were delivered in 2017 and only 23 in 2018. For 2019, total deliveries are expected to be between 20 and 25. This amount is insufficient to keep civil aviation afloat.

Chemezov said in February 2019, "We are currently making a UAC financial audit. To tell the truth, it does not look very good. It requires extra funds of about RUB240Bn to RUB250Bn. The allocated funds should go toward building a brand new airliner MS-21 and modernising the aviation plants." The cost of the brand-new MS-21 increased and the delivery date was postponed to 2021. As long as the UAC financial audit has not been completed, we need to take Chemezov's statement with precaution. In June 2017, Ilya Tarasenko, Director-General of MiG Corporation, said that the "corporate sales reached RUB56.7Bn, while net income was RUB5.2Bn in 2016."

In 2017, corporate sales reached RUB80Bn while net income was RUB3.5Bn. With no new orders from the MoD, and no sales to foreign customers in 2017-19, the company has had to launch the manufacture of the Il-114 regional airliner. It plans to assemble 300 craft, with first delivery expected in 2021. This programme is subsidised by the Russian government.

Aside from companies under the UAC umbrella, the holding Russian Helicopters needs to be mentioned. According to Andrey Boginsky, Director-General of Russian Helicopters, between 2017 and 2030, the holding expects an increase of 3% in the civil segment of helicopters, since "various factors created an unstable situation in the military segment. In many armies around the world, rearmament programmes have been completed which is why the respective share of military sales will drop below 40%." To compensate for such a significant reduction in military sales, Boginsky wants to pursue a more aggressive sales policy, targeting commercial operations around the world. At the same time, the Russian government is trying to alleviate the situation by supporting medical aviation in the country, and it allocated RUB10Bn evenly distributed over three years beginning in 2017. Sergey Khrumagin, Director-General of the State Transport Leasing Company (GTLK) said in November 2018: "Of the 31 helicopters contracted for 2018, we have signed leasing contracts for 22 aircraft at the moment, and the remaining helicopters have already been distributed among the operators, which means that the programme is of tremendous interest and can be prolonged in 2019." It remains to be seen whether Boginsky's idea to pursue a more aggressive sales policy will be successful.

As a result of the reduction in military sales, revenues fell from RUB177Bn in 2015 to RUB165.8Bn in 2016, while just 189 helicopters were delivered. 16 out of 189 were civil helicopters. In 2017, the MoD and foreign militaries bought about 150 helicopters and civilian customers bought 70. In spite of the growth in helicopter sales, revenues declined by 23% to RUB7.55Bn in the first six months of 2017. Unspecified gross or net profit increased by 9% to RUB93.83Bn for the same period. In 2017, the company generated a profit of RUB27Bn (US\$430M) against revenues of RUB228Bn (US\$3.6Bn). In November 2018 Boginsky said that the company is to deliver about 220 helicopters which means that the company remained on the 2017 level of helicopter sales.

Under the leadership of Boginsky, the company Russian Helicopter continues to

be successful. Boginsky has recognised that military sales alone will not compensate for the lack of civilian helicopter sales. As a result, the company plans to develop after-sales support and expects civil helicopter production to increase from currently 30% to up to 50% of total sales by 2025. In order to reduce costs, the holding began to optimise human resources, reallocate responsibilities and reduce the number of top managers. Time will tell how successful the initiatives will be.

Conclusion

As long as no information on the ongoing audit of UAC has been made public, it is premature to make a judgement on the financial assets of the company. Therefore, we must take with caution Chemezov's statement about the financial situation of UAC "to tell the truth, it does not look very good". Although the merger of MiG and Sukhoi is imminent, it remains to be seen whether both companies will retain their own identity within the newly created division. Despite the uncertainty, it appears that both companies would maintain separate operations and brands within a division for reasons of customer recognition around



Photo: Kremlin

Russian Prime Minister Dmitry Medvedev during a visit at the Gorbunov Aviation Production Association. The company currently produces Tu-214 passenger planes and Tu-160 strategic bombers. There are also plans to start producing Tu-334 regional airliners and Tu-330 freighters.

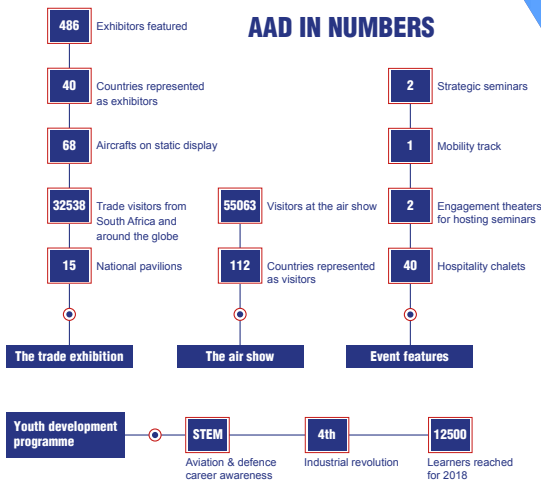
the world. Probably the two companies will work together without unnecessary internal competition. As for UAVs/UCAVs, the international market is currently dominated by the United States and Israel. China is an additional competitor that Russia must take into account. It would take some time for Russia to achieve a breakthrough in the sale of UAVs/UCAVs on the international market. And Russian officials should learn a lesson from their claim that the country's civil

aircraft can compete on an equal footing with Airbus and Boeing. In order to make Russian commercial airliners competitive on the international market, many things need to be done, but that is beyond the scope of this article. It also remains to be seen whether the current managers of the airlines and the company will be retained or dismissed. So at the moment there are more questions than answers. ■

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“Leverage commercial best practices to help the Government gain efficiency”

Photo: Eric Young



Founded in 1951, AAR Corp. is an independent provider of aviation and expeditionary services to the global commercial, government and defence aviation industries. ESD spoke with Eric Young, AAR's Senior Vice President, OEM Solutions.

ESD: What is the core business of AAR?

Young: We are a global aviation services provider to commercial and government customers. Our aftermarket expertise and solutions help customers increase efficiency and reduce costs while maintaining high levels of quality, service and safety. We are the largest independent heavy maintenance check provider in North America and the third largest in the world as well. Our MRO business has seven facilities, 3,000 A&P (Airframe and/or Powerplant) mechanics, six million man hours, with a large focus on narrow-body fleets. When I say independent, I mean not owned by an OEM, airline or operator. Additionally, we have two Component Repair Shops – one in Long Island, NY, and one in Amsterdam, the Netherlands. In combination with our flight-hour support business and our component repair management subsidiary, Airinmar, we are the largest independent provider of component repair management in the world, with 1,200 aircraft under management. And we are also the world's largest independent aviation services provider with government and commercial capabilities.

ESD: What is AAR's ratio of military vs. civilian business?

Young: In principle, every AAR business addresses commercial and military customers. When you look across AAR, the ratio is approximately 35% military and 65% commercial. This comes out to a revenue of US\$700M generated by military projects every year. The largest customer in this area is the US Government, which includes the Army, Navy, Air Force and Department of State with different contracts and different services. The second largest military customer is the Japanese Ministry of Defence, and outside of that, we have a dedicated team that sells directly to 30 other foreign militaries.

ESD: What are the major US military programmes that AAR is currently involved in?

Young: I would like to highlight two of them. One is with the Air Force Sustainment Center, Hill Air Force Base. AAR provides total supply chain management including purchasing, remanufacturing, distribution and inventory control for all C-130, KC-135 and E-3 landing gear parts. Secondly, we maintain and operate the Department of State's global fleet of fixed-wing and rotary-wing aircraft in the scope of its Worldwide Aviation Support Services (WASS) programme. These are very large pro-

grammes, and hundreds of employees are needed to support them. And so far, the execution has been very successful. But every contract is different. In some contracts, we train or even employ the pilots. In other contracts, we manage and perform the repairs of components. Sometimes, we own the components; sometimes, we own the warehouse and perform only part selection and packing. So, it is almost like a menu. We provide individual or bundled solutions. The agreements are very tailored to our customers' needs.

ESD: You support the P-8A POSEIDON programme as well.

Young: That is an interesting story because it is linked to our experience in the commercial airframe maintenance business. The P-8A POSEIDON is a Boeing 737-800 derivative – and our airframe maintenance facility manages that contract for the US Navy. We are one of the few players for airframe maintenance. We like to say: Leverage commercial best practices to help the Government gain commercial efficiency. And especially for the commercial aircraft derivatives, we are in a great position because we already have the supply chain procurement knowledge to maintain the aircraft for the military.



Photo: AAR

run a competitive process as well. It is not like "Oh, you have it – I'll buy it!" They have to open it up for a bid. Therefore, in both markets we have to make sure that we are planning right, stocking right and servicing the mission accordingly to stay competitive.

ESD: Some air forces operate ageing fleets with high and exponentially rising maintenance costs. To what extent can your company help them to alleviate these problems?

Young: OEMs are always focused on the next big thing, on the next generation aircraft. And a lot of these parts needed to maintain legacy aircraft are out of production; they haven't been built for sometimes ten years or even more. That is where AAR comes in. First, we get the part number list and review it. In parallel, we work with OEMs for certain parts and work with repair shops for others. We identify new partners to qualify alternative sources for parts that the OEMs don't want to make anymore and source from the used surplus market as well. Additionally, we develop repair capabilities allowing the OEM to focus on their strengths. There are not that many players that can pull those different markets together to support a legacy aircraft. That expertise is one of our competitive advantages.

The interview was conducted by Peter Bossdorf.

AAR operates an airframe maintenance facility for the US Navy's P-8A POSEIDON fleet.

ESD: AAR recently signed a contract with the Danish procurement authority DALO. What kind of services does your company provide for this customer?

Young: AAR's task is to perform maintenance, repair and overhaul of Pratt & Whitney F100-220 engine components on the F-16 for the Royal Danish Air Force. Our Component Repair Amsterdam facility has been supporting European Participating Air Forces either as a primary or a subcontractor performing repair management, component maintenance, supply chain and depot services for more than three decades.

ESD: Your civilian customers want to be profitable while the military primarily wants to be effective while accomplishing military missions. These are different ways of thinking. To what extent can you leverage your experience in the civilian market to military customers?

Young: Well, obviously they are different markets with different terms, conditions and requirements. But it is the taxpayers' money the US Government is spending, so the contract valuation is very transparent. So, yes, commercial customers are trying to make a profit but at the same time on the military side, they have to

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Forum Entreprises Défense – A Focussed Defence Event in France

David Saw

For those used to events the size of Eurosatory in France, the size and shape of Forum Entreprises Défense (FED) held at the Quartier ingénieur général Jayat, in Satory near Versailles, in October, would come as something of a surprise.

However, FED 2019 is not designed to be a full spectrum defence event; it is far more focussed than that, being aimed primarily at the French military customer.

The exhibition itself is organised by the Structure Intégrée de maintien en condition opérationnelle des matériels terrestres (SIMMT), the French Army integrated structure for the operational condition of land materiel, Chambre de commerce et d'industrie de région Paris Ile-de-France and the Groupement des industries Françaises de Défense et de Sécurité Terrestres et Aéroterrestres (GICAT), the French defence and security trade association.



Photo: IVECO

IVECO Defence Vehicles is one of the many companies looking to win the new French Army truck programme. They are already a supplier to France with the Porteur Polyvalent Terrestre (PPT) programme. Shown here is an IVECO TRAKKER GTF 8x8 truck, one of 133 ordered by the German Bundeswehr.

Author

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

The FED exhibition has been held for the past 30 years in France and the 2019 FED was the 16th event to take place. FED 2019 was expected to have 150 exhibitors, 10 military organisations present and over 2,500 visitors were projected. The objective of the event is to allow for better interaction between the user community and industry, in particular small and medium enterprises, who can also use FED to interact with the larger French defence corporates. Amongst the large French defence companies attending FED were Arquus, MBDA, Nexter Systems and Thales.

One aspect of FED 2019 that was immediately noticeable at the outdoor exhibition area was a significant number of trucks and other military vehicles. The presence of so many truck manufacturers was not wholly unexpected as the French Army is moving forward on a major vehicle programme that will see the acquisition of a grand total of 7,700 logistic and tactical trucks as part of a complete replacement effort of their truck park.

With such a large truck prize on offer, the presence of Arquus, IVECO Defence Vehicles, Rheinmetall MAN Military Vehicles and Scania France was understandable. Although it should be noted that other French and foreign truck/vehicle/systems suppliers have also expressed interest in the French Army truck order. The Direction générale de l'armement (DGA) who are responsible for French defence procurement issued a request for information (RFI) in 2018 to interested parties as regards the provision of new generation military trucks. The next stage will see the issue of a Request for Proposals (RfP) and this will be followed by selected contractors providing vehicles for test and evaluation purposes leading to the selection of a contractor or contractors to supply vehicles for each sector of the truck programme. As might be expected, the current French Army truck park is dominated by vehicles supplied by Arquus, whom it would be fair to describe as the national champion in this sector. However, other companies have won

major orders, for example under the Porteur Polyvalent Terrestre (PPT) programme.

IVECO and Soframe jointly won the PPT programme to deliver two truck variants: Porteur Polyvalent Logistique (PPLOG) and Porteur Polyvalent Lourde de Dépannage (PPLD). The PPLOG is an 8x8 logistics vehicle with a gross vehicle weight of 37,000 kg and a payload of 16,000 kg, it is often integrated with its Remorque Logistique (RLOG) trailer that can carry a payload of 15,600 kg. The PPLD is an 8x8 heavy recovery truck, with a gross vehicle weight of 33,000 kg. Both vehicle variants have an armour protected cab. The vehicles entered service in 2013, a first order for 150 PPLOG and 50 PPLD trucks being placed in 2010. A second order was placed for 250 trucks in 2014 and further orders have been placed subsequently.

As regards the future French Army truck order, the objective is to acquire 7,050 logistics vehicles, 400 tanker trucks and 250 tank transporters. As regards the logistics vehicles the aim will be to acquire both 4x4 and 6x6 vehicles, the first with a payload up to four tonnes and the second with a payload of up to eight tonnes. Apart from the companies that attended FED 2019, other companies said to be working towards the truck order include Soframe and Texelis.

As might be expected Arquus appear to see the French Army requirement as a key opportunity and had a new 8x8 truck at FED 2019, this variant had a fuel tank module and is obviously directed towards the French Army tanker requirement. The 8x8 is the first of what is described as a whole new family of Arquus logistics vehicles, which would doubtless be optimised for the French Army requirement.

There is no hiding the fact that FED is a small and focussed exhibition, but FED 2019 demonstrated that a small exhibition can still have plenty to offer. In this case the fact that the French Army truck order is in process created a situation where the importance of this exhibition was greatly enhanced. ■

“Oh Lord, won’t you buy me a Mercedes-Benz?”

Jürgen Hensel

This song by Janis Joplin, recorded in 1970, already addressed the human desire to own quality items, including a Mercedes-Benz vehicle. To enforce this kind of desire and to take advantage of it, Daimler invited clients and the media to the Mercedes-Benz Defence Vehicle Experience (DVE).

The event’s agenda included briefings and live demonstrations of logistical and tactical wheeled vehicles at the company’s test site near Karlsruhe in southern Germany.

Defence Vehicle Experience

As was explained by Marcus Ernst, MBS’ Head of Sales Defence & Industrial Business, one objective of the event was to draw attention to the company’s service portfolio. The company is present in 85 countries, 39 of which had sent delegations to attend the Defence Vehicle Experience 2019 presentations. Mercedes-Benz Defence Vehicles can refer to more than 210,000 vehicles sold for military applications and 5,000 global service locations. According to statistics presented by the company, the military ground vehicle market has been on the rise since 2014 and is expected to continue with a growth rate of 7% until 2035.

A second objective, obviously, was to take advantage of the event to introduce innovations and draw attention to proven and new products.

AROCS

As far as innovations are concerned, MBS may be the announcement that the modular structure of the AROCS, the successor of the ACTROS series, constitutes a kind of baseline configuration for all heavy off-road vehicles of MBS. Against this background, another interesting feature presented was the integration of Voith’s auto retarder with the AROCS heavy logistic vehicles. The auto retarder enables the driver to control forward and backward movements – as well as standstill – of the vehicle with the accelerator only and without having to shift gears, thus a major advantage if it comes to manoeuvring in challenging environments.

NG ZETROS

The major highlight of the event was the introduction of the New Generation ZETROS



Photos: Daimler

About ten years after the introduction of the first generation series the New Generation ZETROS is offered with stronger engines of up to 375 kW (510 hp) and torque of up to 2,400 Nm.

(NGZ) family of bonnet-type trucks, laid out for transport logistics in tough and challenging terrain. The 40-tonne off-roader has been specifically designed for operations in markets with a high proportion of off-road use. It can be equipped with engines up to a power of as much as 375 kW (510 hp) as well as 2,400 Nm of torque. It has a permanent all-wheel drive system and, compared to the first generation series, it features numerous detail improvements, including easier access to the cab or a re-designed instrument panel. It has a 35° angle of approach and a fording capability of up to 800 mm.

Just as before, the NG ZETROS remains available in Euro III and Euro V variants for markets with poor fuel quality and thus finds its principle markets in regions like the Middle East, Africa or Latin America. According to the company the NG ZETROS can be used in all climate zones of the world.

FGA 9.5 Special Chassis

The 9.5 t chassis was developed with a focus on civilian applications and technically it is

oriented towards the chassis of the all-terrain UNIMOG model series U 4000. Proven components from the UNIMOG are used for the all-wheel drivetrain, including the engine, transmission, transfer case and coil-sprung portal axles with differential locks, integrated in the torsion-free ladder-type frame. To provide an example, the 9.5 chassis on display was equipped with the OM 924 engine with a displacement of 4.8 litres and an output of 160 kW (218 hp), in a choice of emission rating Euro V or Euro III.

The chassis is supplied with a platform which contains all the interfaces and controls for driving the vehicle, including the steering wheel, brake and accelerator pedal and cockpit. Prepared electrical and mechanical interfaces such as a torsion-free 3-point body mounting and a compressor for climate control of the body area facilitate easy and fast integration of cabs for the occupants or other bodies. The numerous optional equipment items include an increased fording depth of 1,200 mm, an increased alternator output of 205 A, a four-channel tyre pressure control system and tail lamps in LED technology. ■

Rheinmetall Signs Risk Mitigation Activity Contract for Australia's Land 400 Phase 3 Programme

(jh) Rheinmetall has signed a Risk Mitigation Activity (RMA) contract with the Commonwealth of Australia, which includes the delivery of three LYNX KF41 infantry fighting vehicles (AIFV) to compete in trials for the AUD15Bn (€9.5Bn) LAND

Image: Rheinmetall



400 Phase 3 programme. The RMA contract has a value of AUD50M (about €30M). LYNX KF41 is a new-generation tracked AIFV designed to meet the requirements of LAND 400 Phase 3 and offers significant growth potential. Under the LAND 400 Phase 3 RMA contract, Australia will undertake a technical and programmatic assessment of two bidders over a period of 24 months. The vehicles will be operated by Australian Army personnel and tested in Australian terrain under extreme conditions, undertaking lethality, transportability, mobility, troop assessments, blast and ballistic testing. In parallel, the Commonwealth will work with the two bidders in a structured assessment phase in order to optimise technical capability, growth, value for money and national prosperity. Rheinmetall is currently delivering 211 BOXER 8x8 Combat Reconnaissance Vehicles (CRV) to the Australian Army after the vehicle was selected by the Australian Government following 12 months of RMA trials in 2016-2017. According to Rheinmetall Defence Australia the three vehicles designated for RMA trials will incorporate significant Australian industry capability. Key vehicle elements of the LYNX KF41 are also being developed and manufactured in Australia by local companies including the alternator (Milspec in Albury), running gear (Sushock in Adelaide) and cables (Cablex in Melbourne). The modular LYNX KF41 vehicle includes the digital LANCE turret with electronic architecture common with the BOXER 8x8 CRV. This would enable the Australian crew to access sensor systems, advanced automatic tracking and targeting capabilities and weapon-integrated battle management, all in one connected and enabled platform. Should

the contract be awarded to Rheinmetall, the LYNX KF41 fleet would be manufactured at the MILVEHCOE, located at Redbank, south west of Brisbane.

Trace Systems Awarded MPE-S Contract

(jh) Trace Systems Inc. has been awarded a US\$998M Mission Partner Environment Services (MPE-S) contract by the US Defense Information Systems Agency (DISA). The contract will provide the full range of global support services to design, implement, and operate the enterprise for the Department of Defense (DoD) and its mission partners. The single-award, indefinite-delivery/indefinite-quantity contract has a performance period of five years. The Air Force Mission Partner Capabilities Office (MPCO) will execute the MPE-S contract, with responsibility for modernisation, management, integration and consolidation of multiple programmes and networks, including CENTRIXS, CFBLNet, BICES, BICES-X, PEGASUS, APAN and the MPE-IS. The Mission Partner Environment will enable essential collaboration between the Department of Defense (DoD) and US coalition partners, connecting nearly 45,000 global users in support of the mission.

Military Communications Study Finds Current Military Technology Falling Behind

(jh) In an era of constant technological advances, defence agencies are falling short of battlefield expectations when it comes to military communications technologies, according to a study released by Government Business Council (GBC), the research division of Government Executive Media Group, in partnership with Viasat Inc., a global communications company. Based on a survey of over 300 US active military and Department of Defense (DoD) participants across the nation, the study investigated the role of military connectivity and evaluated the practicality and effectiveness of US military communication technologies. Among others, key findings from the study include:

- Expectations of connectivity on the battlefield are high, but largely unmet;
- The risk of falling behind new threats;
- Organisations are facing significant barriers to network modernisation efforts;
- Emerging cloud-based systems, artificial intelligence and machine learning capabilities will be critical to future mission success.

Over 60% of respondents agree that cloud-enabled technologies will play an increasingly significant role in enhancing and accelerating the US military's decision-making capabilities. In addition, 81% of respondents agree that it is critical for US military forces to have access to modernised end-to-end satellite and terrestrial networks to make cloud-enabled technologies and the Internet of Battlefield Things a reality across the battlespace.

ASELSAN to Open Factory in Ukraine

(ck) ASELSAN has opened a production facility in Kyiv, Ukraine. ASELSAN has been delivering tactical software-defined military radios for the Ukrainian Armed Forces since 2017 and, in light of the Ukraine's

Photo: ASELSAN



long-term needs and the friendly relations between Ukraine and Turkey, ASELSAN radios are now going to be manufactured locally in Ukraine. ASELSAN sees this as a first step toward future collaborations in other projects as well. The company says it will continue to seek opportunities to develop local cooperation and strategic alliances in Ukraine on defence solutions.

Remote Sensing Network for the Arctic

(ck) On 1 October 2019, a consortium of companies called IRSA Development Group (IDG) was announced at DEFSEC Atlantic in Halifax, Canada. IDG consists of the following companies with expertise in remote sensing technology: C-CORE (Canada), MyDefence System Integration (Denmark), Andøya Space Center (Norway), VTT (Finland), Scott Polar Research Institute (UK), Karl Osen (Switzerland), ViaSat Antenna Systems (Switzerland), and Boeing (USA). Integrated Remote Sensing for the Arctic (IRSA) is a scalable, civilian, all-domain system-of-systems remote sensing solution designed to provide more persistent monitoring of the Arctic. The network comprises satellites, high altitude long endurance (HALE) drones, medium altitude long endurance (MALE) drones,

small unmanned aerial systems (sUAS), sea-surface and sub-sea platforms, and ground stations. Technology development for each segment, and integration, is underway. Initial IRSA services are expected to be available to clients in early 2020.

Counterdrone Devices for Australia

(ck) DroneShield Ltd, a designer of portable counterdrone detection devices, has won



Photo: DroneShield

the Australian MoD tender for portable unmanned aerial system detection devices. The company won the contract following an open tender process. The contract is for approximately AUD700,000, which is a combination of an initial purchase price and an annual subscription component.

Czech Companies at DSEI 2019

(ck) The Czech defence industry is known for its high-quality products and innovative potential. Given the small size of the country and its armed forces, Czech military producers have had to constantly develop their products to be competitive in foreign markets. Czech companies regularly take part in renowned trade fairs, the most recent example of this being DSEI 2019 in London at which they had a large presence. The Czech stand featured 16 companies with a wide range of products, from fibre optic network solutions (OPTOKON) to harness assemblies (Ray Service), ammunition (Sellier & Bellot, STV Group), small arms (Česká Zbrojovka), CWA protection devices (Oritest), mobile surveillance and surveillance systems (EVPÚ Defence), armoured vehicles (SVOS), optical production (Meopta), research and development (VTÚ), modular load-carrying systems (REDO) and others. During DSEI the Czech company Ray Service signed a cooperation agreement with the Israeli

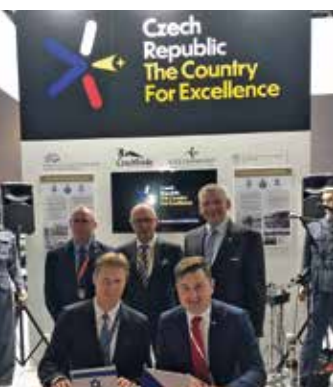


Photo: ESD archive

company Beth-El. The Czech stand at the fair was organised in cooperation with the Ministry of Industry and Trade of the Czech Republic and the Association of Defence and Security Industries of the Czech Republic.

EXPAL at AUSA

(ck) At the recent AUSA 2019 meeting, EXPAL USA showcased its latest developments for the defence and security sector. At its Propulsion Systems Technology Centre, EXPAL designs propulsion systems for rockets, missiles and a wide portfolio of munitions, such as 2.75" (70mm) rocket motors, artillery charges, and single and multi-base propellants, providing these solutions both for defence companies and the Armed Forces. The company also produces semi-processed products including carpet roll, premix, wet and dry pastes and raw materials such as nitrocellulose. EXPAL has been placing particular emphasis on recovering, recycling and re-using up to 90% of removed components, and to



Photo: EXPAL

support this work EXPAL USA has modern facilities in Texarkana and a R&D centre in Camp Minden. EXPAL also manufactures initiation systems, demolition charges and Explosive Ordnance Disposal (EOD) equipment for combat engineers and special operation forces for NATO and allied countries.

Safe BVLOS Drone Flights

(ck) The initial introduction of Unmanned Aerial Vehicles (UAVs) to the airspace has been limited to visual line of sight (VLOS) operations. To extend drone applications, Beyond Visual Line of Sight (BVLOS) operations are essential for governmental as well as commercial deployments, and many countries are now amending their drone policies to allow such flights. This requires accurate and reliable telecommunication data. Frequentis has partnered with connectivity specialist Dimetor to enable network connectivity for command and control (C2) and payload data links to ensure reliable and consist-

ent data sharing. So far, the use of network connectivity and associated data has not been standardised for pre-flight assessment or regulated for operational use. However, recent drone trials in Finland and Estonia for the Gulf of Finland U-space project exposed this requirement and the need for connectivity to enable consistent data sharing between the UAV and the UTM system. The connectivity platform from Dimetor, AirborneRF, is deployed at the operational data centres of Mobile Network Operators (MNOs), processing confidential network data for assuring cellular connectivity for UAV operations. Flight planning tools like Frequentis' CADAS-ATS and other U-space services can use the constraints in the pre-tactical/tactical phase of a BVLOS drone flight and either approve or reject the proposed flight plan. AirborneRF can also be used to demonstrate network capabilities to airspace regulators and UAV service providers. The partnership between Frequentis and Dimetor then enables the MNOs to seamlessly integrate the connectivity information into the aeronautical information management database, and thus to become part of the developing ecosystem for commercial BVLOS drone operations.

Upgrades for GRAY EAGLE UAS

(ck) The US Special Operations Command (USSOCOM) has increased the ceiling on its contract to support modifications and capability enhancements to its Medium-altitude, Long-endurance Tactical (MALET) aircraft. The funding increase from US\$15M to US\$93M is in response to the expanded payload capacity of the newly



Image: GA-ASI

fielded MQ-1C ER GRAY EAGLE Extended Range Unmanned Aircraft System (UAS). GRAY EAGLE ER is designed and manufactured by General Atomics Aeronautical Systems (GA-ASI). The increased funding ceiling ensures that SOCOM has the ability to rapidly develop, procure and field new capabilities, as well as conduct studies, modifications and test events with their fleet of GRAY EAGLE ERs.

Hungarians to Buy Hirtenberger

(ck) The Hungarian Government Commissioner for Defence, Defence Industries and the Coordination of Defence Modernisation announced that HDT Védelmilpari Kft. Company has acquired the Austrian Hirtenberger Defence Group. The acquisition of Hirtenberger is a cornerstone of the Hungarian strategy to develop the Hungarian Defence Industry Sector. HDT Védelmilpari will maintain Hirtenberger as it is and takes full responsibility for all commercial operations and commitments to employees, customers and suppliers. Hirtenberger Defence will continue to operate from all its locations and carry the well-known brand. From 29 October on Hirtenberger will operate under the new ownership; the Hirtenberger management will stay on board.

New IAI Office in Washington

(ck) Israel Aerospace Industries (IAI) North America has recently opened a new government relations and marketing office in Washington DC near the US Capitol. The facility expands the company's presence in Washington DC. "Having a greater presence in Washington is critical to helping us grow our business in the US market", said Harel Locker, IAI's Chairman of the Board. IAI already sources over US\$600M from US suppliers in over 40 states and has partnerships with major US Original Equipment Manufacturers (OEMs) such as Lockheed Martin, Boeing, Honeywell, Gulfstream and General Dynamics.

IAI Delivers 100th F-35 Wing to Lockheed Martin

(ck) Israel Aerospace Industries (IAI) and Lockheed Martin marked the delivery of the 100th F-35 combat aircraft wing delivered by IAI at a ceremony held at the company's wing assembly line. The wings manufacturing centre of IAI's aviation division was established in November 2014, and benefits from extensive experience in making wings for the F-16 and T-38. The centre is now expected to manufacture over 800 F35 wings by 2034. In December 2018, IAI inaugurated an innovative line for production of F-35 wing skins, expanding

Photo: IAI



the collaboration between the two companies. Since entering the production contract, IAI has invested multiple resources into advanced systems and technologies. The total programme involvement offers an income potential of over US\$2Bn.

Communication for Belgian Armed Forces

(ck) The Belgian MoD has contracted INVISIO, in partnership with Thales in Belgium, to deliver a communication and hearing protection system. The order value for INVISIO is approximately SEK30M and deliveries are planned for the fourth quarter of 2019 and mid-2020. INVISIO expects a first follow-up order of SEK20M in the near future and considers that the long-term potential for further orders from its new customer is considerable. The soldier radio programme is one of the Belgian Army's largest military modernisation programmes for communication and hearing protection; it aims to reduce hearing loss and improve users' communication capacities in critical environments. Thales in Belgium is the prime contractor for this programme. INVISIO's communication systems are based on modularity and flexibility to meet the communication needs of users in mission-critical environments, both on land and when mounted. Plug-and-play-integration between control units, intercom, headsets and cables is the key to the INVISIO system, since it enables connection of new INVISIO equipment without configuration.

Mercury to Invest in Trusted Microelectronics Technology

(ck) Mercury Systems, a provider of secure sensor and safety-critical processing subsystems, will invest US\$15M to expand its microelectronics business, bringing commercial silicon technology to the US Department of Defense (DoD). The technology is applicable to all defence platforms and programmes and offers fast, affordable and secure chip-scale open system architecture (OSA) devices to accelerate future modernisation efforts. The initiative is one of the first commercial applications of the Defense Advanced Research Projects Agency's (DARPA) Electronics Resurgence Initiative (ERI) which aims to create a more specialised, secure, and heavily automated electronics industry that serves the needs of both the commercial and defence sectors. Mercury promises to bring open standards architecture at chip-scale to

defence applications such as embedded security, high-performance RF, digital and mixed-signal microelectronics. The company intends to provide chip-scale to system-scale processing solutions optimised for increased performance, reduced power and low latency to meet the rapid growth of massive data processing in edge computing applications such as artificial intelligence.

MTU Opens New High-Tech Test Centre

(ck) MTU Aero Engines has built a new test centre for engine parts on its Munich premises. The company has invested more than €25M in a new building and advanced test equipment and, after two years of construction, the test centre is now opera-

Photo: MTU



tional. MTU's testing capabilities comprise parts, components and complete engines. The company performs development tests, certification tests and production acceptance tests. In the new test centre, MTU will be testing parts that make up compressors and turbines, including blades and vanes, discs, casings, rings, and tubing. Development plans include the testing of new materials, new designs and larger structures. An emerging programme in the military segment is the Next European Fighter Engine, or NEFE for short. This propulsion system will be developed jointly by MTU and European partners, and its parts will be put through their paces in the new test centre in Munich. The facility has been designed in such a way that it can be expanded when needed. With the new facility, MTU has the requisite equipment for as many as 65 different test types – among them spin tests, air flow measurements, structural tests, vibration, wear, ballistic and fatigue tests. The centrepiece of the new test facility is a multifunctional rotation test stand which was built up in a separate enclosure – a twin-wall reinforced concrete structure – and rests on a special soundproof base plate weighing as much as 90 tonnes.

Naval Group to Cooperate with MacTaggart Scott

(ck) Naval Group has preselected MacTaggart Scott Australia for Naval Group Pacific's countermeasures projects in Australia to maximise Australian industry content and to enlarge Naval Group's



Image: Naval Group

technological base in the country. Naval Group will entrust MacTaggart Scott with the fabrication of countermeasures equipment and/or its associated launching system. It is one of nine Memoranda of Understanding (MoU) related to countermeasures signed by Naval Group in Australia. Naval Group has been proposing anti-torpedo countermeasures for Australian submarines and surface

ships programmes (SEA 1000 Australian Future Submarine, SEA 5000 HUNTER class frigates and SEA 4000, upgrade of HOBART class Air Warfare Destroyer) with CANTO, the latest countermeasure generation based on Dilution/Confusion multi-effects. This anti-torpedo system, fitted with its associated reaction module CONTRALTO, is already in service in the French Navy and in several blue-water navies.

Joint Venture Between Naval Group and Fincantieri

(ck) Naval Group and Fincantieri have established a 50/50 owned joint venture called NAVIRIS. The name was presented



Photo: Naval Group

during the recent Steering Committee held in Genoa: The Steering Committee meets every quarter, alternating between France and Italy. This alliance between Fincantieri and Naval Group is an opportunity for both groups to better serve the French and Italian navies, capture new export contracts, develop new technologies and, ultimately, improve the competitiveness of the naval sectors of both countries.

Zeusch Aviation Expands Service Portfolio

(ck) Zeusch Aviation, based at Lelystad Airport (EHLE) in The Netherlands, will begin to expand its fleet of modified KING AIR aircraft in 2020. The company currently provides a variety of aerial services including broadcast relay, aerial surveillance, medevac/organ transport, aerial grid mapping flights and charter. Zeusch intends to expand its defence and security-related surveillance operations with the addition of a new aircraft. The company currently operates three KING AIR aircraft and will be expanding to four. The two KING AIR B-200s and two

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Firms & Faces

KING AIR C90As have been modified to meet their different operational requirements. To perform relay work, a Zeusch Aviation KING AIR C90A has been fitted with extra antennas on the belly and



Photo: Zeusch

wings. A relay boom, approximately two metres long, can be extended during a mission and retracted during ferry flight and landing and an extra camera has been fitted to the belly of the plane so that the pilots can verify that the boom has been retracted prior to landing. The medevac KING AIR 200 aircraft features

the LIFEPORT PLUS patient system which incorporates a stretcher for a single patient. Medical equipment on board includes a vacuum system, compressed air, a three-outlet 1,000-watt inverter (230VAC) and a 3,500-litre oxygen system with remote filling port. Zeusch, as a member of the Dutch Industry Foundation for Defense and Security (NIDV), recently attended the Defense and Security Equipment International (DSEI) exhibition in London, UK, to specifically promote its surveillance capabilities for military, law enforcement and other observers of activities on land and water. "During DSEI, we were honoured to speak extensively with our State Secretary of Defence Mrs. Barbara Visser as well as with Mr. Simon Smits, who is The Netherlands' Ambassador to the UK, plus several defence attachés. We're confident that these conversations are a great first step towards expanding our business within the defence and security arena," said Herman van Kranenburg, Managing Director of Zeusch.

Ariel Karo Appointed as RAFAEL's New EVP Marketing and Business Development



Photo: RAFAEL

(pb) RAFAEL Advanced Defense Systems Ltd. has appointed Brig. Gen. (Ret.) Ariel Karo to EVP, Marketing and Business Development. He succeeds Giora Katz, who is retiring from

RAFAEL after a 17-year career in the company, during which he also served as Head of the Land and Naval division. Ariel Karo (54) joined RAFAEL five years ago, and has since then served as Head of the company's Cyber and ISTAR Directorate. Prior to that, he served in the IDF for 30 years and filled various senior positions, including Head of Field Intelligence and Chief Intelligence Officer.

Preview

- DRAGÓN AIFV Programme in Spain
- Vehicle Decontamination Systems
- Ground Mobility: Suspension; Transmission; Tracks; Wheels
- Hard-Kill / Soft Kill Self-Protection Systems
- Hybrid Power for Lightweight Armoured Vehicles
- LTMP: Light Tactical Mobile Platform(s)
- Medium Calibre Cannons and Ammo
- Power Supplies for Armoured Vehicles
- RCWS Challenges and Advantages
- Scout / Liaison 4x4 Vehicles
- The Return of the 6x6
- Turret Options for 8x8s
- Vehicular Situational Awareness
- UK Armoured Vehicles Programme Analysis

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MITTLER REPORT

Mark your diary: Brussels, 28/29 January 2020
16th NATO Life Cycle Management Conference

Innovation and Disruption in LCM – Opportunities, Achievements and Lessons Learned

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

The annual NATO LCM Conference will continue to consider the lessons learned and achievements made in areas such as Quality Assurance, Life Cycle Costing, Configuration Management, Acquisition Practices, Material Maintainability et al. as a basis for new and innovative, even disruptive approaches and perspectives which will be introduced in respective presentations. The event will again be organised in cooperation with the NATO Life Cycle Management Group (AC/327) and with the support of the NATO Industrial Advisory Group (NIAG) and the German CALS Forum. The conference will be combined with a small exhibition to showcase respective capabilities and will take place at the Parker Hotel Brussels Airport on **28/29 January 2020**.

Dinner Speaker: MajGen. (ret) Rudolf Maus, Director LCM,
NATO Support and Procurement Agency (NSPA)

Contributing Organisations: Brazilian MoD, Italian MoD, UK MoD, NIAG, NSPA, Ingeniería de Sistemas para la Defensa de España, NIIG, Bundeswehr University, Lockheed Martin, Rheinmetall, Systecon, TFD Europe, Troika Solutions.



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