

# European Security & Defence

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- Russian Nuclear Strategy
- NATO Military Engineering CoE
- Royal Norwegian Navy
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- Cockpit Technology Developments
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# Europe Needs More Pragmatism



The elections to the European Parliament in May were beset with more paradoxes than they have ever been. The strongest party which will take its seats in the plenary chambers in Brussels (and, as an expensive anachronism, also in Strasbourg), albeit only for a brief period, is the Brexit Party, with 29 seats, whose programme is implicit in their name. Although EU institutions across the entire continent are challenged in terms of their public acceptance, in many countries the election has been fought with a very great deal of emotion, as if the day of reckoning is dawning, on which decisions will be All or Nothing.

Some have raised concerns about the prosperous "European Project", which they see as in dire need of rescue from malevolent sceptics. Others have painted an image of the decline of the West, which would inevitably come about if Brussels were to be allowed to continue on its present course. Either way, the more "Europe" was discussed - even if only niggles - and the more the parties tried to explain to their constituents what their actual vision for the continent is, at the end of the day voters still voted on the basis of their national prospects. What happens in distant Brussels is something they can hardly take seriously. Conversely, people know exactly what impression parties running for election in their own countries want to convey, as their solutions to the people's "problems". This explains why the Greens fell short in exactly that country where the "Fridays for the Future" campaign of young climate activists started, while in other countries they clearly gained ground; why right-wing populists scored points in Italy and Hungary, but stagnated in Germany and lost ground in Austria; why the Social Democrats triumphed in the Netherlands but faced defeat elsewhere - the list of conspicuous points goes on and on.

What has been seen as a European trend is not, therefore, something which is of uniform significance in all the EU Member States. Rather, it is a summation of the election results of all the Member States. A fundamental change in the party system, its pluralisation, the coming to the fore of protest movements, which sometimes rapidly recede, but which sometimes also become established, are things we have been seeing for some considerable time. In more than a few countries it is increasingly difficult to find stable parliamentary majorities, able to pursue a coherent governmental policy - preferably even beyond more than one legislative period.

Since time immemorial, the plethora of parties present in the European Parliament has been substantially greater than at national levels, not least because some states which otherwise apply majority voting law (such as France and the UK), allow proportional representation at the European level, while Germany does not apply the five percent threshold that applies in national elections. Historically this fragmentation was not worrying because two fractions, the European People's Party and the Social Democrats, heterogeneous as they were in themselves, did at least together constitute a majority. This is now no longer the case.

But this development is not really all that dramatic. Unlike the situation in national representations, in the European Parliament there are no government and opposition fractions confronting each other. Shifting majorities are commonplace, and the assembly's influence continues to be severely restricted, even if nowadays it is integrated into a considerable number of areas of European legislature, undertakes supervisory and monitoring tasks, and has a significant voice in the composition of the European Commission. But overall, the role of the European Parliament is too weak to reject the accusation that the European Union is lacking in democratic legitimisation. Instead, it is displaying to all and sundry that it is not possible to practise representative democracy at the European level; that is to say, it is not possible to implement the will of the citizens in the decision-making process. This is something which only the national parliaments can do (and nowadays only with a great deal of effort).

The foundations of the EU still remain the nation states. As a supranational organisation, it cannot be further developed in the direction of a federal state without encountering problems which it is not able to solve. Whoever tries to pursue this aim will lose public support, and, above all, will waste time doing those things which, pragmatically, can be created from and by the EU.

It may be that in pursuing a more pragmatic course Europe will not become the "global player" that some would like to see, but that is not at all something for which the world is waiting, or that it needs. The actual aims of offering European citizens peace, stability, and welfare, would in no way be compromised by harking back to the original principles of the European unification process.

**Peter Bossdorf**

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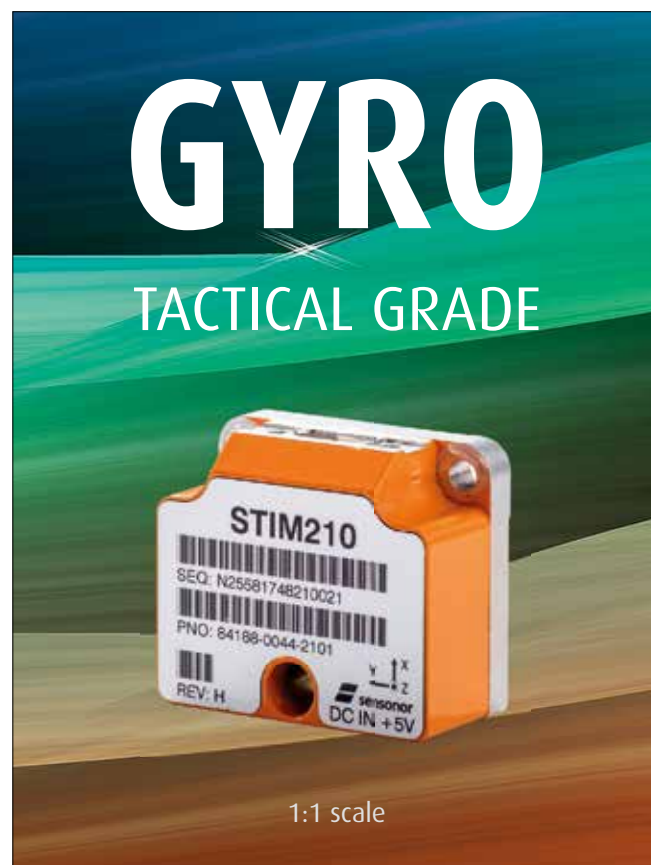
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U.S. defense and security companies looking to enter European markets or expand business there have set their sights on the next edition of MSPO, September 3-6, 2019 in Kielce, Poland, to strengthen partnerships with buyers and influencers in this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

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

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

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

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

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

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

# ASK AMERICA

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Apollo 15 CMP, Al Worden

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

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## ■ French MoD to Bring Forward HIL Programme

(ck) The French MoD has announced that the launch of the Joint Light Helicopter (Hélicoptère Interarmées Léger; HIL) programme has been brought forward to 2021. The HIL programme, for which the AirbusHelicop-

Photo: Airbus



ters' H160 was selected in 2017, was initially scheduled for launch in 2022. Launching the programme earlier will speed up the delivery of the first H160Ms to the French Armed Forces, enabling them to be delivered in 2026 rather than 2028 as originally planned. The H160M has been given its official name and will be known as GUÉPARD (CHEETAH) by the French Armed Forces. The H160 was originally designed as a modular helicopter, and this versatility will enable its military version, with a single platform, to perform missions ranging from commando infiltration to air interception, fire support, and anti-ship warfare in order to meet the needs of the army, the navy and the air force through the HIL programme. The HIL programme should benefit from the many advantages inherent in the civil H160, particularly in terms of support, maintenance and lower operating costs.

## ■ Supporting Australian TIGERS

(ck) The Australian MoD has awarded Airbus a five-year extension of the Australian Army's Armed Reconnaissance Helicopter (ARH) TIGER Through-Life Support (TLS). The TLS extension, until 2025, includes: more extensive aircraft maintenance; maintenance

Photo: Airbus



of training aircraft; aircrew and technician training; design services including OEM design incorporation; systems and software

development and testing; and spare parts support including MRO, purchasing, storage and distribution. The contract should keep more than 200 full time jobs in Australia. The two-seater ARH TIGER attack helicopter is a key asset for the Australian Army which plans to keep the TIGER in operational service into the 2040s. Today, the fleet of 22 ARH TIGERs has flown over 30,000 hours and been deployed for day-and-night surveillance and fire-support missions. Globally, 181 TIGERs have been delivered to Australia, France, Germany and Spain, and have accumulated over 115,000 flight hours to date.

## ■ Hardkill Anti-Torpedo Torpedo

(ck) ATLAS ELEKTRONIK CANADA Ltd has entered an agreement with Magellan Aerospace Corporation for the development of the SEASPIDER Anti-Torpedo Torpedo (ATT) programme. The initial CDN\$19M phase of the programme was launched in January 2019 and is expected to conclude in 2023.

Image: ATLAS ELEKTRONIK



Magellan will design the motor and warhead of the torpedo. SEASPIDER is a new naval defence product by ATLAS ELEKTRONIK, a company of thyssenkrupp Marine Systems, which can be used by surface vessels and submarines for "hardkill" defence against attacking torpedoes. The anti-torpedo systems currently available rely on decoy and jammer countermeasures; in contrast, SEASPIDER destroys the attacking torpedo. The technology has been developed by ATLAS ELEKTRONIK together with the German MoD and now gains a Canadian element in product development. SEASPIDER ATT will combine ATLAS's expertise in torpedoes, submarine and naval systems with Magellan's industry leading rocket technology.

## ■ ARQUUS Launches the VT4 Standard 2 Production Lines

(ck) The French procurement authority, DGA, has notified ARQUUS about the second tier of the VT4 programme. This tier comprises 1,200 new Standard 2 vehicles. Production and delivery of the Standard 2 started in early 2019, and ARQUUS plans to deliver 800 of them in 2019. The VT4 is a non-armoured, light, 4x4 vehicle. It can accommo-

Photo: ARQUUS



date 5 soldiers or 4 FELIN system-equipped operators. With its payload of up to 900 kg, it is designed for homeland operations (Sentinelle, training, liaison), and for foreign operations in low-threat regions. The 3,700 ARQUUS VT4s will equip the Army by 2025, replacing the P4 vehicle. In 2018, the first 500 Standard 1 VT4s were delivered to the French Army. The VT4 Standard 2 integrates 350 new references, and offers several new evolutions compared with Standard 1: integration of modern communication and positioning systems, extra racks, towing equipment and blackout lights. The VT4 Standard 2 is also designed to be air-transportable for extra tactical capabilities.

## ■ Interoperability for NATO Enhanced Forward Presence

(ck) Germany has been the lead nation in charge of the Enhanced Forward Presence Multinational Battle Group in Lithuania since February 2017. From the beginning ensuring interoperability between the participating nations was a key challenge and, in February 2019, the German armed forces handed over the "Information Mediation Service (IMS)" software developed by ESG GmbH to the Lithuanian armed forces. IMS is stand-alone software ensuring interoperability between different command systems

Image: ESG



via international interfaces and special proprietary/national solutions. The software gives all nations involved in NATO Enhanced Forward Presence a unified view of the field situation, at all command levels, for the first time, in order to achieve full interoperability of deployed forces, significantly increasing their capabilities and operational value. In late 2018, the NATO Support and Procurement Agency (NSPA) contracted ESG to supply the IMS software under an agreement between the governments of Lithuania and Germany.



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## ■ Drone Defence for Lithuanian Harbour

(ck) During the NATO "Harbour Protection Exercise 2019" (HPEX19), German IT company ESG demonstrated its GUARDION drone defence system to NATO and Lithuanian representatives. HPEX19 is part of the NATO



Photo: ESG

ordnance disposal operation "Open Spirit 2019" during which the Lithuanian Navy, supported by the NATO Centre of Excellence for Operations in Confined and Shallow Waters (NATO COE CSW), the German Navy Sea Battalion and the Bundeswehr Technical Centre for Ships and Naval Weapons (WTD 71), practised protecting Klaipeda harbour. ESG personnel demonstrated detection, tracking, and countering a sea-launched drone in a port environment. The GUARDION anti-drone system has demonstrated its effectiveness in protecting important political events such as the G20 summit in Hamburg in 2017, the state visit of US President Obama in 2016 and the G7 summit in 2015.

## ■ Protection from Radar-Guided Weapons

(ck) HENSOLDT has developed a new radar warning system, KALAETRON RWR (RWR = Radar Warning Receiver), to protect aircraft and helicopters from radar-guided weapons. Because of its digital design, the new radar warner detects and identifies threats quickly, and with a low false alarm rate, over a wide frequency range. KALAETRON uses artificial intelligence (AI) techniques to detect new threat patterns from a large amount of raw data, to identify the latest air defence radar systems that cover a wide bandwidth or hop



Image: HENSOLDT

between frequencies in fractions of a second. Thus KALAETRON enables aircraft to be protected against upcoming anti-aircraft weapons and integrated air defence systems.

## ■ Air Defence IFF Interrogators for France

(ck) The French MoD has contracted HENSOLDT to deliver its Identification-Friend-or-Foe (IFF) interrogator for very short range and short range air defence applications. IFF systems identify ships and aircraft by automatically sending interrogation signals which are automatically answered by transponders onboard friendly aircraft or ships, thereby distinguishing between friendly and hostile forces. The contract, awarded to HENSOLDT France SAS, covers the delivery of 134 MSR1000I (monopulse secondary radar) destined for integration into the French Army's MISTRAL missile launchers and MARTHA air defence command and control stations. The devices are compliant with STANAG 4193 Edition 3. 41 units will be delivered in 2020 enabling the French very short range and short range air defence platforms to perform Mode 4 and Mode 5



Photo: HENSOLDT

interrogations. Unlike Mode 4, Mode 5 employs encryption techniques to avoid hostile signal manipulation, thus ensuring that the identification process is reliable. With the decommissioning of Mode 4, Mode 5 needs to be introduced into all western forces as a precondition of NATO joint operations. HENSOLDT supplies customers all over the world with IFF equipment and has delivered systems to 42 NATO and NATO-allied nations. In France, the company's equipment is deployed on the aircraft carrier CHARLES DE GAULLE, the RAFALE and MIRAGE 2000 combat aircraft, the NH90 helicopters and several air defence platforms.

## ■ Deployable Military Radar for the UK

(ck) The UK MoD has contracted Spanish defence company Indra to supply the Royal Air Force with an advanced, deployable, long-range air defence radar. The Indra Long Tactical Range 25 (LTR25) L-band radar stands out because it offers high long-range detection capabilities, comparable with those of larger fixed radars, but with the advantage of being able to operate quickly and be transported in relatively small aircraft, such as the C130. The LTR25 is one of the latest radars to have been incorporated into the

Photo: Indra



family of LANZA radars developed by Indra. LTR25 is designed to facilitate deployments outside national territory and to reinforce the surveillance of a specific area on a one-off basis or as backup in the event that one of the fixed radars is attacked or damaged. Indra has deployed around fifty systems in countries all over the world.

## ■ New Offshore Patrol Vessel

(ck) At IMDEX ASIA 2019 the shipbuilding company Israel Shipyard Ltd presented its new multi-purpose Offshore Patrol Vessel OPV-45, designed for naval, paramilitary and HLS missions. Equipped with modern weapon stations, electro-optics and radar and communication systems suitable for various missions, the OPV-45 has a total length of 45.7 metres, a command bridge enabling 360° observation, and offers a sustained speed of above 24 knots. For missions requiring high speed interception, the OPV-45 can carry a Rigid-Hull Inflatable Boat (RHIB). The RHIB can quickly and easily

Photo: Israel Shipyard



be launched into and recovered from water, without a crane, while the vessel is on the move. The work deck can house two 20 ft containers, and the OPV-45 has a complement of 16-24, with additional space for up to 24 people.

## ■ Soldier Training Specific Ration Pack

(ck) Spanish company Jomipsa has created the first Meal, Ready-to-Eat (MRE) ration pack specifically focused on high-performance military training. The "Performance Training Ration Pack" is designed for consumption before, during and after high-intensity physical training, and provides the optimal nutritional provision for each of the



Photo: Jomipsa

training phases, supporting both performance and muscular recovery. It provides specific nutrients such as L-arginine, L-carnitine, vitamins, amino acids and rapid

absorption carbohydrates as well as proteins and minerals. The ration pack offers a practical lightweight solution as the package is small enough to fit into most pockets during training and it weighs only 400 g.

### ■ Armoured Heavy Dump Truck

(ck) Mack Defense has recently presented its new M917A3 heavy dump truck (HDT) which has a number of upgrades including an armoured cab. The M917A3 HDT will go to work immediately on combat support missions overseas, as well as domestic duties in response to floods, fires and other natural disasters, and will be rolled out to active US Army and National Guard units, currently equipped with

older trucks, over the next few years. Offering reduced costs for parts and maintenance, the HDT has improved capabilities



Photo: Mack Defense

when it comes to payload, mobility and occupant survivability: the armoured cab exceeds the Army's blast requirements, while maintaining all interior features of the commercially available Mack GRANITE model, on which it is based.

### ■ Fourth Indian SCORPENE Submarine Launched

(ck) On 6 May 2019 Indian shipyard Mazagon Dock Shipbuilders Limited (MDL), launched the INS VELA, the fourth of P75 SCORPENE class submarines entirely built in India. The second (KALVARI) and the

third (KARANJ) have already been commissioned by the Indian Navy. Following the launch of VELA, MDL will integrate the equipment and machinery onboard before embarking on sea trials. India ordered the SCORPENE class submarines in 2005 and they have been built through technology transfer and partnership with Naval Group, in line with India's "Make in India" policy. The SCORPENE is a 2000 tonne conventional-propulsion submarine designed for



Photo: Naval Group

all types of mission. Stealthy and fast, its level of operating automation allows for a limited number of crew, thereby reducing its operating costs. Its combat edge is highlighted by the fact that it has 6 weapon launching tubes and 18 weapons (torpedoes, missiles, mines).

## EXPAL Integrates Air Armament for EUROFIGHTER

(Esteban Villarejo) The modernisation of the Spanish fleet of EUROFIGHTER combat aircraft (see report on page 63) will also have an impact on other Spanish companies.

For example, the high-end technology company EXPAL SYSTEMS is currently working on the integration of air-to-ground armament of the MK80 ordnance family that enhances the aircraft's operational supremacy in its air-surface training and real-fire combat missions.

"Our objective is to offer MK80 family warheads optimised for Laser/GPS guidance systems, thus expanding the all-weather and precision attack capabilities of the Spanish EUROFIGHTERS", Stéphane Plantinet, Marketing Director at EXPAL SYSTEMS told ESD during the FEINDEF International Defence and Security Exhibition in Madrid. "Our collaboration with the Spanish Air Force reinforces our expertise for a perfect integration of air armament. In addition to the EUROFIGHTER, it allows us to provide integration services for other air platforms such as the C-295 military transport aircraft", Plantinet emphasised. Indeed, the company provides engineering support for integration of standard weapons such as 70mm rockets as well as MK 80 series warheads for the C-295W in the scope of an agreement signed with Airbus Defence and Space three years ago.

Apart from the Spanish fleet of combat aircraft EXPAL SYSTEMS is working with BAE SYSTEMS to support the development of an enhanced air launched weapons capability for the EUROFIGHTER aircraft. This project involves engineering support for the integration of various standard weapons with MK 80 series warheads. This integration forms part of the Phase 3 Enhancements Package B, which has been contracted to further evolve the EUROFIGHTER fleet.



Photo: EXPAL

**Stéphane Plantinet, Marketing Director at EXPAL SYSTEMS**



## ■ Ninth FREMM Frigate Launched

(ck) On 18 April 2019, Naval Group launched the multi-mission FREMM frigate, ALSACE, thirteen months after the keel laying of the first block. In addition to being the seventh unit in the class, ALSACE is also the first of two air defence variations destined for the French Navy. The ALSACE was ordered by OCCAR on behalf of the French procurement authority DGA and integrates a number of modifications ordered by OCCAR in response to operational requirements. These technical adaptations translate into: more powerful multifunctional radar, reinforced communication tools, three additional consoles for the Combat Management System

Photo: Naval Group



SETIS in the combat information centre (CIC), and enhanced air defence capabilities with ASTER 15 and 30 missiles. The ALSACE will also receive a new mast to increase its detection performance. The ship will be responsible for the air defence of the CHARLES DE GAULLE aircraft carrier.

## ■ 12 Mine Hunters for Belgium and the Netherlands

(ck) The Belgian and Dutch navies have contracted Belgium Naval & Robotics, a

consortium comprising Naval Group and ECA Group, to supply twelve mine-hunting vessels. Equipped with around 100 drones, constituting approximately ten drone systems (toolboxes), six

ships are destined for the Belgian Navy, whilst the other six will be delivered to the Dutch Navy. The ten year contract is worth nearly €2Bn. After a three-year design phase, Belgium Naval & Robotics will launch the production phase of the ships and drone systems. First deliveries are expected in 2024.

Image: Naval Group



## ■ Integrated Air and Missile Defence

(ck) Northrop Grumman has delivered to the US Army the first engagement operations center (EOC) for the Integrated Air and

Photo: Northrop Grumman



Missile Defence (IAMD) Battle Command System (IBCS). IBCS represents a paradigm shift for IAMD by replacing legacy stove-piped systems with a net-centric approach to address an evolving array of threats. The system integrates disparate radars and weapons to construct a far more effective IAMD enterprise. IBCS delivers a single integrated air picture as well as broader surveillance and protection areas. With its open systems architecture, IBCS allows incorporation of current and future sensors and effectors and enables interoperability with joint C2 and the ballistic missile defence system. The IBCS EOC has completed all configuration audits for major configuration items and system verification review, and is representative of the production configuration for hardware and software that will undergo qualification testing before IOT&E. Northrop Grumman is on track to deliver 11 EOCs and 18 IFCN relays for the IBCS programme by the end of the year.

## ■ SeaFIND Inertial Navigation System

(ck) Northrop Grumman has launched the Sea Fiber Optic Inertial Navigation with Data Distribution, (SeaFIND), a successor to the company's MK-39 Mod 3 and 4 series Inertial Navigation Systems. SeaFIND uses eFOG technology to maintain equivalent performance comparable to larger gyroscopes with on-board data distribution in a smaller footprint, weight, power consump-

Photo: Northrop Grumman



tion and total cost of ownership. SeaFIND provides navigation capabilities in a compact package, making it suitable for applications where low cost as well as reduced size, weight and power requirements are critical. It is the first maritime inertial navigation system to move from the existing ring laser technology to Northrop Grumman's fibre optic gyro technology (eFOG). The system has embedded navigation data distribution capabilities, allowing interfacing with a multitude of users that require accurate position and timing. Its smaller size allows for flexible installation in tight places. Applications include guidance systems for unmanned underwater vehicles and unmanned surface vehicles, coastal and offshore patrol vessels, as well as small, medium and large surface vessels.

## ■ New Cooled MWIR Long Range Lenses

(ck) MKS Instruments has recently introduced its OPHIR SupIR 45-900mm MWIR f/4 and SupIR 50-1350mm MWIR f/5.5 long range, motorised, continuous zoom lenses. The MWIR f/4.0 and f/5.5 lenses are part of a larger collection of long-range, high-performance, thermal imaging lenses suited for 15 and 20µm VGA and 10µm HD formats, based on an open communication protocol that enables simple integration over a detection range of up to 26km. Building on the legacy of SupIR 15-300mm MWIR f/4 zoom lens with its proven track-record of thousands of units operating in the field and its rugged design, the new SupIR 45-900mm f/4 delivers high image quality for long-range observation systems. All lenses use the same communication protocol to smooth integration into existing camera systems. They are especially designed for UAV applications as well as other applications where weight and size are critical.

## ■ Otokar Presented Scorpion II

(koe) Serdar Görgüc, the CEO of Turkish defence company, Otokar, has recently unveiled the AKREP II (Scorpion II), Turkey's first electric armoured vehicle (E-AV). Görgüc describes AKREP II as being a first step for Otokar in the field of electric, hybrid and autonomous military vehicles. AKREP II builds on the success of AKREP, and has been specifically designed to meet the evolving demands of current and future military environments with its increased speed and manoeuvrability, compact size, low silhouette, low acoustic and thermal signature, and effective firepower. AKREP II is designed for three crew members – driver, weapon operator and commander. The ve-





Photo: OTOKAR

hicle's 250 km range can be increased with additional batteries, which take three hours to recharge if completely drained. AKREP II will be ready for delivery to its first customers within the next 12 months.

### ■ Sensor Networking Platform for Real-Time Imaging Systems

(ck) Military imaging systems have traditionally used point-to-point interfaces to connect sensors, processors, and displays. This approach adds system and integration costs as well as redundancy and failure concerns. More critically, it results in difficult to operate vehicle electronics (vetronics) systems for an already overburdened crew. In response to these issues, Pleora Technologies, a de-



Photo: Pleora

signer of video interfaces, has developed a sensor networking platform that helps system integrators increase mission-effectiveness for end-users while meeting interoperability and scalability demands in size, weight, power and cost (SWaP-C) sensitive real-time military imaging systems. The RuggedCONNECT NVPU converts sensor data from multiple sources into a standardised feed that is transmitted over a low latency, multicast Gigabit Ethernet (GigE) network to endpoints. With the scalable, modular RuggedCONNECT platform, manufacturers can design straightforward camera-to-display systems and cost-effectively evolve to fully networked architectures integrating different sensor and display types, switching, processing, and recording units. Migrating to a unified sensor and display network, manufacturers can reduce hardware and equipment within the vehicle and deploy simplified, less expensive cabling to help meet cost and weight objectives. With all

devices connected to a common infrastructure, sensor data can be transmitted to any combination of mission computers and displays. Vehicle crew can view the information they need on a single display, and know immediately if something has changed in their environment.

### ■ ROSY Smoke Screens for Portugal and Belgium

(ck) Two NATO nations have contracted Rheinmetall to supply its ROSY rapid smoke/obscurant system in order to protect their vehicle families. The two orders are worth several million euros: as a result of these orders ROSY will soon be in service in 11 countries. Delivery of 126 systems to Spanish defence contractor URO Vehículos Especiales S.A. (UROVESA) was set to begin in April 2019. UROVESA will be installing



Photo: Rheinmetall

these systems in 126 of the 139 VAMTAC protected patrol vehicles purchased by the Portuguese armed forces. Rheinmetall will also deliver ROSY to British company Jankel which is supplying the Belgian Army with Light Troop Transport Vehicles (LTTV): all 199 of the vehicles are being prepared for integration of the system. ROSY provides protection from surprise attacks by creating a wall of smoke/obscurant that renders vehicles invisible to the enemy by producing an instantaneous, extensive, multispectral interruption in the line of sight and generating a dynamic smoke screen that provides moving assets with long-lasting protection. Thanks to effective screening measures in the visual and infrared spectrum, including integrated IR jamming and decoying effects, ROSY reliably wards off all TV-, EO-, IR-, IIR-, laser- and SACLOS-guided weapons.

### ■ SWIR Sensor Launched into Space

(ck) Semi Conductor Devices (SCD), a developer of cooled and uncooled infrared detectors and high-power laser diodes, has started operating its CARDINAL InGaAs SWIR (Short Wave Infrared) detector. The detector has been integrated into a hyperspectral imager installed in the Hello World Nano satellite. The hyperspectral imager was developed by the Finnish VTT and the

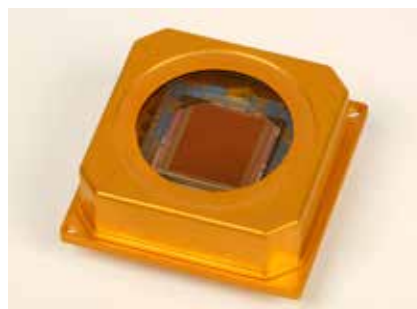


Photo: SCD

nano satellite by the Space Lab reactor. The imager provides infrared images that help provide solutions for monitoring and managing the effects of climate change and assisting in the prediction of natural disasters such as forest fires: images from space received by the VTT imager to date are of a very high quality.

### ■ IFF Antenna for PATRIOT

(ck) Raytheon and PIT RADWAR have recently completed the integration of a PIT-RADWAR made Identification Friend or Foe (IFF) antenna into a PATRIOT radar, for delivery to an international customer. An IFF antenna enables PATRIOT to determine whether an aircraft is operated by friendly or hostile forces; a necessity in the growing threat environment. Raytheon has been manufacturing PATRIOT in Poland for some time, and PIT-RADWAR is part of Raytheon's supply chain. The PATRIOT is the backbone of air and missile defence for Poland and 15 other nations. Seven NATO nations rely on PATRIOT.



Photo: Raytheon

### ■ FIELDGUARD for Brazil

(ck) Brazilian defence contractor Avibras has contracted Rheinmetall Air Defence to supply its FIELDGUARD 3 military measurement system. FIELDGUARD, which can cover ranges of up to 100 kilometres, is a fire control system whose special sensors enable it to measure the trajectory of projectiles, thereby assuring maximum precision when engaging targets. The new order, worth a figure in the low double-digit million-euro range, is a part of the programme originally started in 2012, in partnership with Avibras, in order to realise the ASTROS 2020 multiple rocket launcher system.



Photo: Rheinmetall

## ■ CAMCOPTER for Norway

(ck) The Norwegian Andøya Test Center has selected Schiebel's CAMCOPTER S-100 Vertical Takeoff and Landing (VTOL) Unmanned Air System (UAS) for search and rescue tests

Photo: Schiebel



within the Arctic 2030 project. The aim of the Andøy Municipality project is to demonstrate the ability of VTOL UAS to improve maritime safety in the Arctic. For these tests the CAMCOPTER will be equipped with an Electro-Optical/Infra-Red (EO/IR) camera cardan, an Overwatch Imaging PT-8 Oceanwatch payload, an Automatic Identification System (AIS) receiver and a Maritime Broadband Radio (MBR) from Radionor. This combination of payloads will strengthen emergency preparedness in the region and support search and rescue missions. The CAMCOPTER also offers a number of advantages for marine operations in the Arctic. As a VTOL platform, the CAMCOPTER requires no launch or recovery equipment and its minimal footprint is ideal for offshore patrol vessels (OPVs) with small deck sizes. The CAMCOPTER can operate in extreme weather conditions and fly in temperatures as low as -40°C. This has been proven in a number of tests, including the Canadian icebreaker operation, during which the CAMCOPTER was used 60 nautical miles north of Fogo Island to obtain a wide-angle

image of the ice structure and to identify the boundaries between shallow and rough ice. The Norwegian tests are scheduled to start in autumn 2019, with the UAS being used by Coast Guard vessels in Andfjorden, Norway. Further missions in Spitsbergen are planned for spring 2020.

## ■ CH-53K KING STALLION for US Marine Corps

(ck) The US Navy has contracted Sikorsky to deliver 12 CH-53K KING STALLION helicop-

Photo: Sikorsky



ters with a contract valued at US\$1.13Bn. These helicopters are part of a 200 aircraft programme for the US Marine Corps. Under the terms of the contract, known as Low Rate Initial Production (LRIP) Lot 2 and 3, Sikorsky will begin delivery of the 12 CH-53K helicopters in 2022, and will also provide spares and logistical support. The CH-53K is the only sea-based, long range, heavy-lift helicopter in production and will provide three times the lift capability of its predecessor. The CH-53K will conduct expeditionary heavy-lift transport of armoured vehicles, equipment, and personnel to support distributed operations deep inland from a sea-based centre of operations. The new CH-53K is the only heavy lifter planned to remain in production until 2032 and beyond.

## ■ Fire Control System for German Corvettes

(ck) The German Navy has contracted Thales to equip all new German K130 corvettes with the Electro-Optical MIRADOR Mk2 observation and tracking system. This contract, together with the one signed in March 2018 for the delivery of the TACTICOS infrastructure for the Combat Direction System (CDS), completes the Thales element of the K130 project. The signed MIRADOR Mk2 contract includes 12 systems. Accordingly, all five new German corvettes will be equipped with two MIRADOR Mk2 systems and, in addition, two land-based systems will be supplied for test and training purposes. MIRADOR Mk2 is a monitoring, tracking and fire control system with an unobtrusive design that contributes to a ship's efforts to go unnoticed. Designed for use on a large number of platforms, from small patrol vessels to large frigates, MIRADOR Mk2 can function as an observation system and fire control director for optical surveillance at a distance, but can also be used for anti-surface warfare and anti-air warfare against fighters and missiles.

Photo: Thales



## ■ Water Containers for Croatia

(ck) The Croatian armed forces have contracted THIELMANN WEW to deliver a self-contained 10,000 litre water transport and dispensing unit. The order will see THIELMANN WEW deliver a single unit for testing and evaluation by the Croatian land forces. Delivery will take place by the end of 2019. Based on the company's Heavy Vehicle Module (Water) concept, the Multi Water Tank Container is a self-contained 'drop and go' drinkable water storage and distribution system fitted within a low profile 20ft ISO frame. With integrated heating, pumping and 2.4kW generator system, the system can pump 150 litres per minute and can be transported on military logistics vehicles with DROPS/hooklift capability. The system requires no site preparation prior to its deployment and can provide a stand-alone capability or be integrated into a wider camp infrastructure.

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# Su-35: The Multi-Role Super-Manoeuvrable Fighter



The production of the Su-35 (Russian designation Su-35S) 4++ generation multi-role super-maneuvrable fighter is one of the top priority programmes of the Sukhoi Company, a subsidiary of the United Aircraft Corporation (UAC).

The Su-35 fighter's prime task is to gain air superiority and to destroy surface/ground targets at day and night in all weather conditions at long distances from its base. It is a transition version of aircraft between 4th and 5th generation fighters.

The Su-35 incorporates many of the advanced technologies implemented with

the 5th generation Su-57 fighter. Distinctive features of the aircraft include a high flight envelope, high-altitude and better manoeuvrability characteristics, long-range information and targeting systems, and a modern communication system for exchange of high-speed information both between aircraft and aircraft and ground control stations. Apart from these features, the Su-35 is fitted with highly effective air-to-air and air-to-surface long-range guided missiles, advanced electronic countermeasures and self-defence systems. Advanced signature management provides for reduced

radar visibility. The propulsion system is based on new engines with a digital control system and thrust vectoring features and significantly improves aircraft performance and manoeuvrability.

Maximum speed at low level is 1,400 km/h, and 2,400 km/h at high altitudes. The service ceiling is 18,000 m. The maximum combat payload is 8,000 kg. The phased-array radar can detect aerial targets at a range of up to 400 km. It can track up to 30 targets and engage up to 8 of them in parallel at long ranges. The onboard optical sensor suite units detect and track several aerial targets at a range of up to 80 km.

The implementation of design advancements aimed at improving the operational and technical characteristics of the aircraft has increased the life-cycle of the aircraft; maintenance time has been reduced by the introduction of an automated troubleshooting system.

The Su-35 technical characteristics allow it to successfully compete with foreign analogue counterparts: 4 and 4+ generation fighters such as RAFALE, Eurofighter TYPHOON and upgraded versions of F-15, F-16 and F/A-18, as well as the F-35 and F-22A.

The series production of the Su-35/Su-35S is taking place at the Sukhoi Company's Y.A. Gagarin Aircraft Plant in Komsomolsk-on-Amur (KnAAZ). Aircraft of this type have been delivered on order to the Ministry of Defence of the Russian Federation as well as to foreign customers.



Photos: Sukhoi



# Relations between Iran and Syria

## A Marriage of Convenience or an Axis of Resistance?

**Andreea Stoian Karadeli**

Throughout the last 40 years, relations between Syria and Iran have developed on the basis of a shared sense of threat and of an effective approach to both convergence and divergence of interests in the region.

**R**elations between Syria and Iran, defined by analysts either as a "marriage of convenience" or an "axis of resistance", have survived all the crises in this unstable and unpredictable region. This article analyses the forces that have shaped the alliance between Syria and Iran and examines the military, economic and diplomatic relations that have existed over the last four decades.

Photo: President Iran



**On 25 February 2019, Syrian President Bashar Al-Assad met with Iranian President Hassan Rouhani to talk about the situation in war-torn Syria. Iran has been a strong supporter of the Syrian regime.**

### Balance of Power

The theory of the balance of powers has created the framework for understanding and further analysing the decision of states to form alliances. However, this theory has been questioned for the analysis of Syrian-Iranian relations and has been refuted in many aspects, making this alliance even more intriguing. At its core, the theory says that states forge alliances to protect themselves from stronger powers. To this end, states form alliances with weaker partners to counter a bigger threat. That has been the case with the Syria-Iran alliance. A shared perception of threat was an important cohesive factor for these two actors. The theory of the balance, however, argues that states with similar characteristics are more likely to form an alliance, as Morgenthau's argument of "ideological solidarity" suggests. However, the Syria-Iran axis proves the opposite: states with opposing ideologies can actually form a sustainable partnership when they shape

their relations properly. Syria, a secular pan-Arab country, and Iran, an Islamic republic, couldn't be further away ideologically. And yet this alliance has always been stabilised by common threats. Although helpful with some of its arguments, the theory of the balance of power does not address the most important aspect – the relevance of the context, both individual and external. The individual profile of these two countries, which results from the historical, cultural, social, political and economic factors in the unstable Middle East, is the most important pillar for understanding Syrian-Iranian relations. Therefore, an understanding of the regional context is more helpful than the traditional theory.

### The First Spark

In 1946, Syria gained independence from France, but it had no functioning government; it only gained national stability under the rule of the deceased Hafez Al-Assad. His rule lasted until 2000, when his son Bashar Al-Assad took over the Syrian leadership. Syrian-Iranian relations developed between 1979 and 1982. In 1979, the Islamic Revolution resulted in a regime change in Iran and ended the rule of the Pahlavi dynasty that had existed since 1925. The defeat of Pahlavi Shah – a strong Western ally and promoter of the Western lifestyle – sent a message to the Western powers, and to the United States in particular, that they were no longer in control of Iran.

### Author

**Andreea Stoian Karadeli** is freelance researcher based in Turkey and a PhD Candidate at Mihai Viteazul National Intelligence Academy in Romania. Her interdisciplinary research varies from cultural and intercultural studies to conflict resolution and focuses on national security and terrorism, with expertise in the Middle East.



Syria was the first country to recognise the new Iranian government because it saw it as an opportunity to strengthen its regional role by balancing common enemies such as Iraq and Israel. From the outset, Syria-Iran cooperation has been dependent on regional asymmetry. With limited natural resources and a high exposure to external pressure, Syrian leaders recognised the importance of an alliance with neighbouring Iran. Similarly, Iran, surrounded by hostile pro-Western nations, also needed an ally like Syria to ensure that its regional interests were protected, including a buffer zone to Israel.

After the Iranian Islamic Revolution, both countries turned over a new leaf and began to build an alliance that would last to this day. Though repeatedly challenged over the past 40 years, the Syrian-Iranian alliance had its most difficult times during the Syrian civil war that began in 2011. Since then, Iran has used its power to ensure that the Assad regime would prevail in its struggle against the entire international coalition.

## The Iran-Iraq War

The Iran-Iraq war was a key factor in consolidating the political, economic and military alliance between Syria and Iran.

One of the most common threats to Syria in the 1980s was Baathist Iraq. Although they had a similar political ideology, since the Sykes-Picot agreement Syrian-Iraqi relations have been problematic due to a strong historical rivalry for regional and Arab leadership. Several disputes have exacerbated the strong disagreement between the two: allegations of mutual interference in domestic politics, disputes over the Euphrates water, oil transit charges, and the position towards Israel.

During the Iran-Iraq war, the direction in which the Syrian-Iran alliance would develop first became apparent. Both Hafez Al-Assad and the Iranian leadership were aware of the importance of close coordination of their policies. When Saddam Hussein invaded Iran, Damascus began to provide valuable diplomatic and military support to Tehran. The alliance was formalised through a series of bilateral agreements on oil and trade in March 1982, when a high-level Syrian delegation led by Foreign Minister Abd al-Halim Khaddam visited Tehran. The relationship did not end with political and economic ties; on that occasion, a secret military treaty was signed allowing the delivery of heavy weaponry from Syria to Iran. The strategic importance of this agreement is underlined by the regional relations that Syria

had established with other Arab countries before the war. This gave Damascus the necessary means to reduce tensions with Iran diplomatically and, at the same time, to create opportunities for indirect trade with the rest of the Arab League.



Photo: Khamenei.ir

**Former Syrian dictator Hafez Al-Assad, the father of Bashar Al-Assad, has built the relationship with Iran. Depicted is a visit to Iran on 1 August 1997, where he met with Supreme Leader Ali Khamenei and President A. H. Rafsanjani.**

The cooperation was not only advantageous for one side, but was a win-win situation, because Syria was allowed to establish a military presence at the headquarters of the Iranian Ministry of Defence in early 1983 and received advice and information on Iraq's military strategy, training and use of Soviet weapons. The Syrian regime also supported Iran by capping Iraqi oil pipelines, resulting in an enormous financial loss to Baghdad – an estimated \$17 million a day. In addition, the regime sent Syrian troops to the Syrian-Jordan border, forcing Iraq to prepare for war on its western border. All these measures enjoyed overwhelming approval from the Iranian clergy, the military and the people, as well as security guarantees and, most importantly, energy subsidies as compensation. For example, Tehran provided Syria with a total of US\$400M in the form of a grant and one million barrels of oil per year at a favourable price. This was a significant stimulus for the Syrian economy, and it was only the beginning for Syria to reap more and more benefits from its alliance with Iran.

## The Israeli Invasion of Lebanon

Soon the already established and formalised alliance entered a new phase when the two countries decided to align their military efforts in light of the Israeli invasion of Lebanon.

Syria entered Lebanon in 1976 as part of an Arab peacekeeping force following the outbreak of the Lebanese civil war. The scale of the Israeli attack surprised the Syrian regime and changed its relationship with Iran. This time Syria needed Iran's help. Given its

long-standing presence in Lebanon, Damascus was able to leverage the Lebanese war economy by offering Iran the much-needed strategic economic depth in Lebanon. Iran's access to the Lebanese quagmire gave Assad the leverage he needed to deploy Iranian resources and implement his "sword and shield" strategy. By doing so, Iran served Assad's offensive goals in Lebanon; Assad used the influence of the Islamic Republic on the Lebanese Shiites to conduct a campaign of subversion, terror and guerrilla warfare against their common opponents. In the winter of 1982, two thousand Iranian Revolutionary Guards were stationed in the Syrian Bekaa Valley. Over time, they established close ties with Shiite militias in the region, such as Amal and Hezbollah. The situation in Lebanon gave the Syrian-Iranian alliance the opportunity to deepen its influence in the Levant and to use its forward defense strategy to expand its regional influence. For Iran, an active role in war-torn Lebanon was an opportunity to export its revolution and fight Israel and its Western allies. In addition to paramilitary personnel, Iranians were also bringing clerics to the region to expose the local Shiite population to their religious and ideological teachings. In addition, Iran supported Hezbollah financially and with personnel, making southern Lebanon an essential buffer zone between Israel and Syria. The Syrian-Iranian alliance led an effective, unconventional fight against the Israeli forces and forced the Israeli troops to withdraw from Lebanon.

## The Aftermath of the Israeli Withdrawal

After Israel's withdrawal in 1985, the political vacuum which remained overshadowed the success of the Syrian-Iran alliance because the two countries had different objectives. While Iran wanted to export the Islamic Revolution to the Lebanese countries, Syria was determined to stabilise the region and exert more influence.

Two factors posed significant obstacles to Syrian-Iranian relations: the massacre of Hezbollah and the growing rivalry between Amal and Hezbollah in southern Lebanon. But Damascus and Tehran finally understood that it was better for them to stick together and navigate their different regional goals appropriately. That is why a compromise was found. The two crises showed that the alliance was not only a "marriage of convenience" dictated by temporary, converging interests but had in fact become a stable, long-term partnership – a true "axis of resistance".

## The 1990s

In the 1990s, the Syrian-Iranian alliance became more formalised with the establishment of the Syrian-Iranian Joint Higher Cooperation Committee, chaired

Photo: Media Service of the President of Russia



***Without the support of Russia and Iran, Bashar Al-Assad of Syria would not have maintained his power; he met repeatedly with Russian President Vladimir Putin and members of the Russian General Staff and the Russian Ministry of Defence.***

by its respective Vice-Presidents and Foreign Ministers, to promote economic and political cooperation. In addition to the political and economic dimension of the alliance, Syria and Iran once again demonstrated the importance attached to the military level of their relations, as demonstrated by a joint programme to acquire the capability to produce ballistic, cruise and surface-to-surface missiles, leading

to the successful establishment of production facilities in Hama and Aleppo. Cooperation between the two countries was also influenced by the collapse of the Soviet Union, which resulted in the loss of Damascus' main arms supplier.

After the Gulf War of 1991, Iraq's military capabilities and its ability to harm Syria and Iran were severely weakened. But the common threat remained: a strategic partnership between Turkey and Israel and the US emerged, which turned into competition between pro-Western Israel and Turkey on the one hand and Iran and Syria on the other. This period was also an impressive example of Hafez Al-Assad's strategic balance of relations with all sides.

## The 2003 Iraq War

Hafez Al-Assad died on 10 June, 2000, and his son Bashar Al-Assad became president of Syria and has held this position to this very day, defying the violence that began in 2011.

Even during this time the two countries maintained their alliance in view of the common threat – the USA. Although both Syria and Iran supported US counter-terrorism efforts following the September 11 attacks and the US invasion of Afghanistan, the 2003 US invasion was crucial to changing the alliance's strategy. As in his father's time, also for Bashar Al-Assad, Iran proved to be Syria's most valuable ally. Despite some disagreements over Iraq, Tehran maintained its partnership with Damascus, especially after 2003. But the Syrian civil war became the greatest challenge for the alliance.

Photo: AlMahra



***Initially, Iran supported the Arab Spring uprising, but that stance changed completely when the Arab Spring came to Syria. Depicted are Arab Spring protesters in Aden.***



## The Syrian Civil War

The Arab Spring uprising began in Tunisia in 2010 then spread to Libya and then Egypt. In the beginning, Iran declared its support for the demonstrators, who largely questioned the authority of conservative pro-Western regimes. Underlying the Iranian leadership's view was the belief that the uprisings would unleash a new pan-Islamic wave in the Middle East that would defeat pro-Western governments and bring Islamic governments into power again. But Iran's stance changed completely when the Arab Spring came to Syria. As soon as the protests began, Iran extended full political and military support for Assad's regime and ignored popular sentiment in the Arab-Muslim world. Given the historical context, Iran had no choice but to support the Assad regime. In the event of a regime change, Iran could face the loss of an important ally, which would further isolate the country in a dangerous time. Iran's support for the Syrian regime shredded its reputation in the Arab-Muslim world and damaged its relationship with the Hamas movement, as Hamas supported the Syrian opposition. Iraq and Hezbollah also supported the Syrian regime.

And support for the Syrian regime did not end there; Iran, Iraq and Syria have signed a US\$10Bn gas contract for the transit of Iranian gas to Europe. Iran continues to support the Syrian regime by supplying arms and helping the regime build its military. Iran has also established Revolutionary Guard bases in Damascus and Latakia. These bases were designed to secure Iran's ability to transport weapons and troops through Syria to create an Iranian military footprint in close proximity to Israel and Lebanon. The Latakia base gives Iran the ability to transport weapons without freight oversight by the aviation authorities. In addition, Syria and Iran have strengthened their partnership to develop weapons of mass destruction while ensuring mutual security and regional influence. Iranian security and intelligence services have advised and supported the Syrian military to keep Bashar in power. The Quds Force is responsible for Iran's external operations, and Commander Qassem Suleimani has played an important role in leading Iran's activities in Syria. In this context, former Syrian Prime Minister Riad Hijab declared after his transfer: "Syria is occupied by the Iranian regime. The person leading the country is not Bashar Al-Assad, but Qassem Suleimani, the head of the Quds Force of the Iranian regime."

Unlike the other rulers who were toppled by the uprisings during the Arab Spring, Bashar Al-Assad is still in power after more than eight years, mainly because of the old alliance with Iran and the support of Russia.

## Conclusion

The last eight years have put the Syrian-Iranian alliance through a tough test, and both sides have demonstrated their commitment. Although their objectives differ, both Syria and Iran know that a lasting alliance secures their common priorities: the survival of the regime, national security and territorial independence. Iran wants to be the main political actor in the Levant and the Arab Gulf and therefore supports Syria in its approach to Israel and the United States and to ensure that the Lebanese Government does not pursue policies detrimental to Syrian interests. For four decades, Syria and Iran have been learning that together they are stronger, and the Syrian war has once again proved it. What initially looked like a "community of convenience" has developed into Syrian-Iranian relations and has become a strong "axis of resistance". And as recent developments have shown, they are no longer alone. ■

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## Viewpoint from Pretoria



### A Mixed Blessing: South Africa after the Elections

Helmoed Römer Heitman

While the recent general election in South Africa brought the expected return of the ANC to power, it also brought some other interesting results. The ANC saw its share of the vote drop from 62.2% in 2014 to 57.5%, the lowest since 1994, a clear sign of voter dissatisfaction. This also helped the populist Economic Freedom Fighters (EFF) increase its vote from 6.4% to 10.8%. The Democratic Alliance remains the largest opposition party with 20.8%, down from 22.2% achieved in 2014.

Worrying from a national rather than ruling party perspective is that only 73% of eligible voters registered for the election and only 65.95% of them actually voted. More worrying still is that a large proportion of those who did not even register were young people with only a 33% registration rate among 18-to 19-year olds. Combined with the election results, this suggests not just a dissatisfaction with the ruling party but with the political system as a whole, particularly among the young who have been worst hit by unemployment, now standing at 27%, and as much as 50% among the younger age groups. Worse still, is the fact that the lowest registration was in those provinces with the weakest local economies. That could be a warning of troubles to come.

#### Trouble to Come

That, however, is a future challenge, as President Ramaphosa and his new cabinet face a number of more immediate challenges to address.

The greatest and most urgent challenge will be in reviving an ailing economy. This will be difficult given that much of what is wrong stems from policies dear to the heart of the ruling party and its political allies - the trade union grouping Cosatu and Communist Party. Himself a corporate businessman, Ramaphosa will understand why the economy is ailing, but may struggle to take his party with him. A particular problem is that the ANC took some ideas from the EFF on its own to undercut the EFF. One is 'expropriation without compensation', which is hardly likely to attract the kind of foreign capital investment South Africa needs badly at the moment.

Second in urgency will be to 'clean house' in the state-owned companies, which have been crippled by a lack of planning, poor management and corruption. Key among them is the national elec-

tricity supplier, Eskom, which has startling debt of some \$42 billion and continues to trade at a loss and struggles with maintenance issues and poor build quality at new power stations. If Eskom cannot be turned around, the economic prospects will remain gloomy. The problems at the railways and South African Airways are minor by comparison, they are nevertheless significant in themselves.

The third challenge is to ramp up service delivery by government, particularly to the poor. This has been deeply unsatisfactory in many respects, despite ample funding. The problem has been a combination of poor management and corruption.

#### Rampant Corruption

A related but longer-term challenge is to improve basic education system, which has produced dismal results again despite lavish funding. If that is not corrected, higher education will not be able to remedy the situation and the economy will be starved of the people to run it. None of this is unknown to South Africa's leaders. However, many have chosen to ignore evidence that contradicts cherished beliefs and views. Correcting the situation will require more than just addressing the massive levels of corruption in the state agencies, which is now being revealed by several public commissions. It will require a change of mindset in the ruling party, which will not be easy to achieve. Yet, this is not impossible as there are many in the ANC who understand the issues and the solutions but have not had their 'hands on the wheel'. If President Ramaphosa succeeds in this respect, the economy will go on to recover. Then comes the next challenge, to demonstrate effective government and service delivery before the next elections are held.

While things do not look good, South Africa still has a basically sound and well diversified economy, one that can recover quickly given the right impetus. It is an economy that despite the emigration of many successful business people and skilled professionals, still has a remarkable ability to innovate. It is also the only manufacturing economy of any note south of the Sahara and the closest such economy to much of the Middle East.

There is potential, and President Ramaphosa is well qualified to gather the best advice and take the right decisions. However, he will face an uphill battle to drag his party and allies along this path.





**After the elections, President Cyril Ramaphosa announced measures to boost the South African economy. Despite its solid economic roots, South Africa struggles with numerous problems.**

A quite different challenge lies in regional security. South Africa has the largest and strongest economy of southern and central Africa, which makes it de facto a regional power. Yet, one of its potentially most profitable markets is in the southern/central African region, if only because of its proximity. However, that market will only prosper and grow if there is “peace, security and stability”, as President Mbeki pointed out at Davos in 2001. Therein lies existing, looming and potential challenges.

## Regional Security

The existing challenges are primarily the ongoing conflict in the east of the Democratic Republic of Congo (DRC) and the apparently Islamist insurgency in northern Mozambique. Both hold direct economic risks for South Africa: Some 160,000 jobs depend on exports to the DRC, and Mozambique’s gas fields will become a major source of energy. However, these are conveniently located for pumping to be disrupted by the guerrillas in the north who have already carried out minor attacks, while escalating violence, which will undermine its economy and its ability to import goods from South Africa.

The primary looming challenges are wider instability in the DRC, already visible in the Kasai province, and conflict and instability along the periphery of the Southern African Development Community (SADC). The SADC’s immediate neighbours are the DRC is fragile; the Central African Republic (CAR) is a failed state; South Sudan is suffering a sporadic civil war; Uganda and Rwanda; Burundi, engaged in self-mutilation; and Kenya. Spill-over from conflicts along the periphery can also have a negative impact on the region’s economies and, therefore, also on South Africa.

That is why President Zuma deployed a small – in the event too small – force to the CAR and deployed additional forces to evict the Seleka

Photo: GCIS

rebels from Bangui, only to be stymied by the Central African heads of state who insisted on giving Seleka ‘a chance’.

Potential challenges exist in the situation in Zimbabwe, which is far from being stabilised, the off and on instability in Lesotho and potential instability in Swaziland.

## Danger of Conflict Spill-Over

The bottom line is that South Africa needs peace and stability around it but faces the reality of some conflict within the SADC and the real danger of conflict spill-over from countries along the periphery into the SADC – mostly into the already fragile DRC.

The armed forces of most of the SADC countries are too weak to do much about the situation, and as the de facto regional power, some look to South Africa to act, albeit with diminishing confidence. The challenge here is that a quarter of a century of underfunding the defence sector has left the Defence Force short of many critical capabilities – key among them in this context being airlift, as was so clearly demonstrated in Bangui in March 2013, when the Defence Force had to scramble to charter transport aircraft to deploy a force of not much more than two companies with only light vehicles.

With the defence budget having been just cut – for the first time in many years in real terms – and the acquisition budget planned to be



Photo: US Army Africa

**South African troops perform community service in Postmasburg on Nelson Mandela day, 18 July 2017. Unemployment among young people is high in South Africa.**

slashed to just \$57 million in 2021/22, the prospect of recovering such capabilities is zero. Meanwhile, the Defence Force is steadily losing more capabilities and the defence industry is suffering from a lack of orders that also impacts their future export potential.

The problem is obvious, but the solution is difficult. The Defence Force needs more funding, as successive defence ministers have repeatedly pointed out, but the cupboard, while not quite bare, is close to that. And there are many other real and pressing demands on state funds as well.

# Russian Nuclear Strategy after the INF Treaty

Stephen Blank

Putin and his staff have introduced explicitly ruthless threats, including nuclear threats, into Russian reasoning about acute international crises. They hypothesise about the high political value that would accrue as a result of nuclear use on a limited scale.

The INF treaty regime collapsed due to Russian cheating. Although China's massive buildup of intermediate-range ballistic and cruise missiles played no small role in galvanising US opinion and transforming international security, Russia's deliberate deployment of up to 100

NOVATOR or 9M729 missiles furnished a decisive trigger for Washington to exercise its right of withdrawal. Indeed, Moscow has deployed four battalions of this missile thus threatening both European and Asian targets. Even worse, Latvian Foreign Minister Edgar Rinkevics recently commented

of these and presumably other nuclear weapons, which remain the priority procurement for the Russian military.

## The New START

So while commentators have expressed alarm that the demise of this treaty regime could leave both Moscow and Washington bereft of an arms control "architecture", fact is Moscow deliberately and with ulterior strategic objectives in mind violated this treaty and has possibly also violated the New START (Strategic Arms Reduction Treaty), even though the State Department claims it is in compliance with it. Indeed, Russian Ambassador to Washington, Anatoly Antonov, has now admitted that Russia's new strategic weapons do not come under New START's rubric. That is, they circumvent the treaty and will not be discussed in any new treaty negotiation, thereby demonstrating the insufficiencies of the New START. Simultaneously, Secretary of State Pompeo also revealed that these fears of no arms control architecture should be allayed as preliminary discussions have begun with Russia on a new arms control treaty when this treaty expires in 2021. Thus we are negotiating with a power whose reputation for compliance is dubious at best and who may have violated the original treaty and definitely circumvented that treaty whose subsequent renewal is the issue under discussion.

In December 2017, Bill Gertz reported, "Russia is aggressively building up its nuclear forces and is expected to deploy a total force of 8,000 warheads by 2026, along with modernising deep underground bunkers, according to Pentagon officials. The 8,000 warheads will include both large strategic warheads and thousands of new low-yield and very low-yield warheads to circumvent arms treaty limits and support Moscow's new doctrine of using nuclear arms early in any conflict."

Photo: US Department of State



**Ambassador Eileen Malloy, chief of the arms control unit at the US Embassy in Moscow, Russia, is pictured at the destruction site in Saryozek, (former Soviet Union) Kazakhstan, where the last Soviet short-range missiles were eliminated under the INF treaty in the spring of 1990.**

## Author

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

that Latvia knew Russia was violating the treaty long before Washington decided to withdraw. Latvia and the US also knew and discussed the fact that Moscow had already targeted the Baltic States with four different types of missiles banned under the INF treaty and deployed in Kaliningrad and European Russia. In other words, even if one believes, as some evidence has it, that Russia produces nuclear weapons in droves simply because that is what its defence sector can reliably do, there was and is a strategy behind the deployment



This is quite plausible. Existing Russian programmes can support the deployment of 8,000 or more nuclear weapons with an emphasis on either strategic or non-strategic (tactical) nuclear weapons or both.

## New Nuclear Weapons

Moreover, during 2018 and 2019 President Putin has regularly trumpeted the virtues and capabilities of new nuclear weapons that Russia is designing. In his statements it is crystal clear that he is threatening both the US and NATO. Indeed, Russian officials have long advocated nuclear weapons that can overcome or circumvent the US missile defence system to which they have ascribed truly magical powers in spite of dozens of briefings specifying its real capabilities and analyses by reputable Russian experts. These new weapons include hypersonic, multi-warhead ICBMs, laser, underwater autonomous, nuclear-powered cruise missiles, air defence systems with an anti-satellite (ASAT) potential, land-based and ship-based cruise missiles, not to mention conventional weapons like the Su-57 fighter jets, and so on. Furthermore, the ground forces now fill 11 brigades, each carrying 12 ISKANDER-M missiles with a range of 400-500 km and capable of delivering conventional, nuclear, or fuel-air warheads. These are also supplemented by comparable air and sea-based missiles, for example the KALIBR cruise missile. Thus, all in all Moscow is now building between 20-23 short, intermediate and long-range nuclear weapons comprising both countervalue and counterforce projects, and these are part of a long-term project, discerned long ago by US intelligence agencies to build a fleet of nuclear weapons tailored to every conceivable kind of contingency and range. More recently, General Paul Selva (USAF), Vice Chairman of the Joint Chiefs of Staff, said that Russia is also developing new tactical nuclear weapons to tailor its forces to virtually any contingency. And that is only one of over 20 Russian programmes currently under way to manufacture and deploy nuclear weapons, for example, a heavy ICBM, new bombers, new SLBMs, and missile submarines. Moreover, given current procurement plans and counting rules under the New START Russia could actually increase its nuclear weapons and still comply with that treaty. Finally General John Hyten (USAF), commander-in-chief of US STRATCOM has testified that Russian weapons are being built to circumvent the New START, obviously a view at odds with that of the State Department, but probably more accurate. All these de-

velopments impel us to examine what Russian nuclear strategy really is, especially as it appears to be developing what arguably is an excessively unbalanced and nuclear-heavy military. For as Charles Dick has recently written, why would Russia invest considerable resources in creating offensive and defensive capabilities for the conduct of nuclear war if it was not prepared, or even did not intend, to do so? Is this part of a far-sighted, comprehensive

world are bent on overthrowing it, then permanent posture of being in a state of siege and relying on nuclear weapons to overcome conventional inferiorities makes sense. This is the well-known Russian world view, even though it exists largely in the fevered minds of Russia's leaders, not Western ones. And, of course, this also resembles Pakistan and North Korea's reasons for building nuclear weapons, as well as Israel's original situation when its pre-

Photo: US Defense Imagery / Jose Lopez



**Soviet inspectors and their American escorts stand among several dismantled Pershing II missiles as they view the destruction of other missile components. The missiles are being destroyed in accordance with the Intermediate-Range Nuclear Forces (INF) Treaty, 14 January 1989.**

preparation for war, or is it a part of an influence operation to deter and intimidate political enemies?

In posing this question, however, Dick omits the possibility that Russian strategy might comprise both the influence and deterrence operation on the one hand and the preparation for war or conflict on the other. Arguably this is the real answer and this essay attempts to substantiate this proposition.

## Russia's Nuclear Strategy

If we try to think with Moscow, as proper analysis of Russian strategy requires, today's emphasis (not to mention during the Soviet period) makes considerable sense. If a regime, overwhelmingly cognisant of its own domestic illegitimacy and possessing an obsession with having an acknowledged great power status, believes that for years stronger alliances (namely, NATO) and the strongest power in the

sumed programme began in the 1950s. But beyond these well-known facts, nuclear weapons serve multiple purposes for Moscow. Russian doctrine advertises the deterrent purpose of its nuclear weapons, and if NATO attacked first, especially if targeting nuclear command and control, we could reasonably expect to see a retaliatory first strike. But deterrence only begins here. Russia's ability to intervene in neighbouring states and its coercive diplomacy towards them and NATO "rests upon its nuclear arsenal, as well as on the newest conventional weapons, and is used for both defensive and offensive purposes." Thus deterrence does not stop at deterring a NATO attack but rather includes Russia's interventions in what has been called the grey zone, for example, its original attack on Crimea and the Donbass and its intervention in Syria. Thus the tailored nuclear arsenal replete with capabilities that can be employed at all levels and ranges of conflict and the capacity to inflict what



Moscow calls calibrated damage upon an enemy that will compel him to stop hostilities is automatically invoked whenever Moscow intervenes abroad to deter any kind of US and/or NATO response.

## An Asymmetrical Strategy

Russian nuclear weapons therefore are part of what Putin has called an asymmetrical strategy. And defenders of Russian policy, for example, Andrei Tsygankov,

pansion into Russia's historic sphere of influence, retaining regional hegemony in Eurasia, and demonstrating improvements to Russian military capabilities. The presence of nuclear weapons is perhaps the first critical component for modern hybrid warfare. Nuclear weapons provide insurance against a massive ground response to an incremental limited war. The offensive nation that possesses nuclear weapons knows that the adversary or its allies will not likely com-

for nuclear use is classified while, open doctrinal statements are hardly revealing. That Russia could use nuclear weapons in a first strike when the survival of the state is at risk is self-evident for a nuclear power, especially one that is haunted by the spectre of state disintegration and that cannot afford to lose a war. But Russia's "nuclear behaviour" is sufficient grounds for real anxiety. As Colin Gray observes, even though there is no sign of Russian discourse concerning the use of a nuclear weapon to defeat NATO in limited nuclear scenarios, Moscow talks as if it can achieve this outcome.

In a manner that is ominously reminiscent of Adolf Hitler, Putin and others have chosen to introduce explicitly ruthless threats, including nuclear threats, into Russian reasoning about acute international crises. They hypothesise about the high political value that would accrue as a result of nuclear use on a limited scale. The hoop, apparently, is that the NATO enemy, certainly the less robust members, at least, would be outgunned either by the actuality, or more likely only by the credible threat of nuclear use, especially in a first-strike mode.

## Escalation Dominance

Not surprisingly, and as we argue here, Gray's inescapable conclusion is that escalation dominance is Russia's strategic goal. While no such scenario has yet occurred nor is likely, this does show just how nuclear scenarios are intertwined with conventional wars. Presumably, a network of conventional scenarios leads to supposedly limited nuclear war scenarios, perhaps with tactical nuclear weapons, for which the West has not yet found an answer.

In this way, traditional strategic deterrence is broadened to cover both Russian nuclear and conventional assets. On the other hand, the abolishment of the restrictions for the use of nuclear weapons means that the dividing line between waging war with conventional or with nuclear weapons is vanishing. When the principle of surprise is connected to this idea, it seems that Russia wants to indicate that non-strategic nuclear weapons could be regarded as "normal" assets on a conventional battlefield. This is the basis upon which Russia regulates the level of deterrence for example in the Kaliningrad exclave. By introducing the concept of pre-emptive strike to its military means, Russia is trying to enhance its non-nuclear deterrence even further.

Thus we see a broader nuclear strategy that aims to use these weapons to control the entire process of escalation through-



Photo: Sergei Lysenko

**Russia sent Soviet-era long-range BLACKJACK bombers to Venezuela to be stationed at La Orchila island 160 miles off Caracas.**

ov, explicitly invoke this kind of strategy. Thus, Tsygankov writes that, "It seems that a major factor in understanding the present and future global transition processes will be a global rethinking of (asymmetric) resources available to international actors, ideas and perceptions of the leaders of major powers, and the nature of internal political processes." Though he omits nuclear weapons here, it is quite clear that they, like cyber capabilities, serve that purpose.

Nuclear weapons consequently serve a much broader strategic need than deterring real or potential conventional or nuclear strikes. As Dmitry Adamsky observes, "The nuclear component is an inseparable part of Russian operational art that cannot be analysed as a stand-alone issue". This is because it abets Russian conventional threats and aggression through the deterrence of adversaries' counteraction to that aggression. Similarly, Major Amos C. Fox writes that the strategic defence provided by Russian nuclear weapons and its IADS facilitate attainment of all of Russia's conventional warfare objectives: deterring NATO ex-

mit large ground forces to a conflict for fear of the aggressor employing those weapons against ground or naval forces. This dynamic emboldens the aggressor nation. In the case of Russia, its possession of nuclear weapons emboldens leaders to take offensive action, because they know that even the threat of nuclear employment forces potential adversaries to a standstill.

## A Limited War

As Fox points out this is how Moscow can use nuclear weapons to prevent NATO from responding to a limited but large-scale Russian attack and thus limit a massive ground response to an "incremental limited war."

Therefore we arrive at a conclusion that nuclear weapons are not used merely to intimidate, deter, or threaten enemies but are rather a primordial instrument of an effective strategy of escalation control and conflict regulation. Moscow's behaviour and apparent nuclear strategy validate these points because the document detailing that strategy and conditions

out the crisis from start to finish. If the crisis becomes kinetic, then escalating to de-escalate may well become an operative possibility within that framework. This kind of strategy explains the violations of the INF Treaty and the new developments in Russian nuclear weaponry. Although some claim that the decision to violate the INF is connected to NATO enlargement, the strategic rationale of girding for war with the West and attempting to develop the capabilities for dominating the former Soviet glacis and even projecting limited power abroad are bound up in this approach.

Nuclear weapons are therefore critical instruments for prevailing in an environment of international rivalry and contestation that from Moscow's view is characterised by the struggle for relative, rather than absolute, gains – a climate of small grey zone clashes that are controlled in Russia's favour due to its nuclear arsenal and proclaimed readiness to use it first across a range of contingencies. Still, in deciding to get involved in a conflict and utilise coercive diplomacy, Russian civilian and military authorities do believe that the conflict itself could be located within existing norms of international law. Russia's

economic and military resources would allow a standoff against any opponent along Russian borders for a limited period of time, while its nuclear weapons prevent the conversion of a conflict into full-fledged war.

In this context, the possession of a wide range of usable nuclear weapons allows Moscow not only to dominate its former Soviet peripheries and threaten all of Europe and the United States, it also allows it to project power abroad in places as far away as Venezuela and Syria without too much fear of consequences and then steadily enhance its strategic and military position in these areas. While Moscow is doing so, its intermediate and longer-range conventional and nuclear missiles hold European, American (and if it ever came to this, Chinese) military power at risk. We have already seen repeated examples of this strategy in Ukraine and Syria so that Moscow not only now has an integrated air and naval defence capability in and around the Black Sea that threatens littoral states like Ukraine, Georgia, Turkey, Bulgaria, and Romania; it has also long since begun building a chain of naval and air bases across the Middle East and Eastern Mediterranean.

## Projection of Power

We now see signs of the projection of power into Africa through private military contractors but in Venezuela we see regular troops who will probably expand previous efforts to gain air and/or naval bases in Venezuela if not elsewhere in Latin America. When Putin was preparing the recent expedition to Venezuela of 100 Russian Air Force troops and accompanying materiel he also warned Washington, in relation to the INF treaty, that he was ready for another Cuban missile crisis if Washington wanted one. Since then not only has he dispatched these forces, but he also sent TU-160 BLACKJACK long-range strategic bombers there in late 2018 to suggest what might follow. And now apparently the Kremlin is also setting up an Air Force Bomber Group in Venezuela. Lt.Gen. Vasily Petrovich Tonkoshkurov leads this formation, and the term "military group" in Russian denotes an external group of forces or air group commanded by a comparably high-ranking General. We have seen such formations in East Germany, Vietnam, Angola, and more recently Syria. This group not only will be

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**On several occasions Putin has met Nicolas Maduro, President of Venezuela, to discuss urgent issues. Maduro's predecessor Hugo Chavez has offered the Russians the island of La Orchila for the stationing of Russian aircraft.**

the beachhead for an expandable presence, it will also no doubt provoke the US. The forces and their logistical supply, including an Ilyushin Il-62M CLASSIC and an Antonov-124 CONDOR are already in the theatre and BLACKJACK bombers are apparently being readied at Engels-2 base in southern Russia for a journey around the Norwegian North Cape via mid-air refuelling and down the Atlantic to Venezuela.

### Another Cuban Missile Crisis

Undoubtedly, as these forces are being reinforced so will air and/or naval bases be developed for them. In late 2018, Venezuela announced that Russia is obtaining a long-term base on the island of La Orchila that had been offered to Moscow a decade earlier by Hugo Chavez. The base is some 160 miles from Caracas and home of a Venezuelan airfield and navy base. This is a portentous event and a harbinger of developments to come. Moscow has been interested in Latin American bases for at least a decade. Indeed, in February 2014 Defence Minister Shoigu explicitly mentioned Cuba, Venezuela and Nicaragua as places where Moscow wanted naval and air bases. The Venezuelan crisis and the collapse of the INF treaty regime thus appear to have come together in official policy to produce a result that threatens to create a base for BLACKJACK strategic bombers carrying ICBMs or Intermediate Range Ballistic Missile to target the US. In addition, Russian commentators openly stated that this would be the beginning of Moscow's nuclear retaliation against the

US for its intention to leave the INF treaty. Accordingly, we can expect regular visits by nuclear-capable planes and ships to the neighbouring naval base if not permanent deployments since a precedent has been set unlike 1962 and 1969.

### In Washington's Backyard

This will also show many different audiences that Moscow is able to play in Washington's "backyard", as it claims the US is doing, for example in Ukraine.

There are even reports of Moscow, through low-level contacts, offering Washington a deal, namely, we will stay out of your backyard if you get out of Ukraine. And, along with the Venezuelan air base it has apparently gotten the right to make port calls here. In fact, earlier in 2018 Venezuela's Defence Minister Vladimir Lopez told his Russian counterpart Sergei Shoigu that Venezuela aspired to go beyond arms sales to an operational level cooperation. This raises the question of what operations these governments are thinking of, where they might take place, and against whom they might be directed? This question becomes especially pertinent when we realise that Venezuela, at least, is expecting more Russian troops.

It is not only the US or Canada that should feel threatened by such deployments covered by a likely nuclear umbrella. Russian forces in Venezuela or client forces, like the estimated 15,000 Cuban forces there, represent a threat as well to other Latin American countries of either intervention or organised subversion backed up by a robust conventional and nuclear deterrent. Already in Colombia in 2018, Venezuela's

neighbour and a staunch US ally complained that, "Venezuela's joint military exercises with Russia should put the entire South American continent on alert against an 'unfriendly act'."

### Diminishing Returns

Russia's actions in Venezuela, Syria, and Ukraine correspond to Tkachenko's theory that Russia is employing "a new strategy for nuclear powers." This strategy employs nuclear weapons not only to threaten and deter but also to make the world safe for limited Russian wars by controlling escalatory dynamics and conflict regulation processes. The metaphor is 'careless pedestrian behaviour', for example, entering a road and forcing drivers to stop their car lest superior force including nuclear weapons be brought to bear.

In several cases, Russian leaders have utilised military means in a mass, holistically, and in a risky manner. Russian leaders today consider military standoffs with political opponents in neighbouring states as comprehensive operations of its Army, operating under authority of a single commander, while all needed resources are mobilised for the sake of immediate breakthrough.

This is an audacious strategy of limited war, where nuclear weapons are always there to deter and allow Moscow to take risks to achieve any positive transformation in the status quo. But as Alexander Gorchakov, a 19th-century Tsarist foreign policy maker that Russian leaders love to quote, memorably wrote, the danger lies in knowing where to stop. As Putin's hunger for great power adventures grows with the erosion of public support and the total absence of economic reform, so does the likelihood that he will intervene somewhere to uphold the myth of the great power, and thus the possibility of a serious escalation and misjudgement. Gorchakov's colleague P.A. Valuev wrote about the "lure of something erotic in the borderlands"; it still seems to drive Russian statesmen even beyond knowing where to stop. The effort to build a nuclear arsenal usable as far as possible across the entire spectrum of conflict is novel and innovative. But when we look at Ukraine and the other examples where Moscow seems all too willing to run the risk of nuclear escalation – has it really been a successful strategy, not only in our eyes but in Putin's and is it not subject to the law of diminishing returns? Since these returns constitute the future of his system and his state, if they decline beyond the break-even point, then what will remain for Russia? ■





# Viewpoint from Kiev



## Volodymyr Zelensky – Servant of the People

Alex Horobets

Ukrainian presidential elections have shown the success of a number of technologies that have worked in favour of one of the presidential candidates.

During the 2016 US presidential election campaign, journalists wrote that the team of Republican candidate Donald Trump used the services of Cambridge Analytica who tried to convince US voters to vote for Trump applying a wide variety of sophisticated digital analysis tools.

Later came the reports that this private company interfered in the course of more than 200 elections worldwide. Besides the US, just as significant was the scandal around its co-operation with UK's Vote Leave campaign during the 2016 Brexit referendum. The company profiled people according to their political views in order to better target Facebook ads. The ultimate result of the vote depended on 1% of the electorate. Therefore, it is believed that working with social network users had a key impact on the results of the vote in favour of the UK's withdrawal from the EU.

After a series of publications on the impact of modern technology on the election outcome, it became clear that this sort of activity is a new reality, and then it will become even more interesting.

The recently held Ukrainian presidential elections have shown the success of a number of technologies, which worked in favour of one of the presidential candidates. And, due to this fact, these elections were monitored across the world.

### A Politicised Sitcom

On November 16 2015, a heavily politicised sitcom 'The Servant of the People', produced by Kvartal-95 Studio, was aired for the first time. It concerned a history teacher suddenly becoming Ukrainian President with a famous Ukrainian comedian, Volodymyr Zelensky, founder of the Kvartal 95, playing the main role. So far, all three series have proven to be quite highly rated among citizens. The plot portrays an idealistic picture of a regular person becoming president, able to defeat corruption and external enemies, and becoming a national hero. Political analysts had already suggested that the idea of nominating a candidate for the actual presidential elections could happen after the first season of the series was shown.

On 31 December 2018, at one minute before midnight, when the New Year's address of the President is traditionally broadcast on all TV channels, Zelensky said on channel 1+1 he was running for president. After that, 1+1 aired the address of incumbent president, Petro

Poroshenko. Many attributes this to the fact that the media holding belonging to Ukrainian oligarch Ihor Kolomoisky. Although Zelensky has tried more than once refute his connection with the oligarch.

### A Middle Class Man

The following message can be traced in 'The Servant of the People' Party: 'there is a corrupt oligarchic system in Ukrainian politics. With the election of a middle class man, the era ends.' This message was the basis of Zelensky's successful presidential campaign. With no political experience whatsoever, he came to power in April's elections, gaining 73.22% of the vote, defeating Poroshenko who received 24.45%.

It is impossible to say that Zelensky sealed his victory only due to his presence on television and online. In Ukrainian society, there was a great demand for a 'total reboot' of power structures. People often associate all problems, including those faced at the local level, with the figure of the president. In addition, before the elections, investigative journalists published stories on corruption in various sectors. Zelensky was elected, among other things, on his election promises to change the existing system.

Zelensky has headed Studio Kvartal 95 since 2003. Since 2012, his 'Evening Quarter' comedy show has been broadcast on Ukrainian television on a weekly basis. These and other projects have allowed him to gain more recognition among citizens. Both the series and comedy show were full of political and social satire targeted toward the government.

### A Double-Edged Sword

However, the fact that Zelensky is famous among many Ukrainians for criticising the authorities and popular in the media is a 'double-edged sword'. On the one hand, it delivered him excellent election results, yet, on the other hand, his lack of experience in politics is constantly becoming the object of criticism on the part of his opponents. Therefore, rather quickly, he will need to meet those high public expectations.

Another criticism is his format of communication with the media and voters during the campaign, which mostly boiled down to short



video appeals on social media. In turn, the economic, defence, social and other areas of his future policy are still commented only by advisers within his team.

Given the media component of his election campaign, it was clear that his presidency would be rather unique. His Instagram account has an astounding 5.4 million subscribers, while his short video addresses gain millions of views. Most likely, this format of communication will continue. However, we must bear in mind that he is unlikely to be able to pursue this format alone as he will be expected to gain more understanding in all aspects of foreign and domestic policy. His team of advisers and experts was formed a few months before the elections, and a great deal of emphasis in their selection was placed on their 'background' in politics. Among his team are: Ruslan Stefanchuk (focusing on reforming state and legal institutions), Dmytro Razumkov (domestic issues), Oleksandr Danyliuk (international relations, economics, financial and banking), Ruslan Riaboshapka (law enforcement and anti-corruption), and Ivan Aparshin (defence and security).

## Fighting Corruption

Zelensky's policy vision in the field of defence and security remains unchanged and seeks a continued course towards co-operation with NATO, continued creation of a professional army and modern system of territorial defence. A priority will also be placed on fighting corruption. It most likely be possible to talk more about a more specific policy in the field of security and defence after he has made his first appointments, as well as after the adoption of a national security strategy, the development of which is expected to take six months.

After a brilliant victory comes the routine. His first test will be early parliamentary elections scheduled for 21 July 2019. Presidential elections have shown that the demand for a renewal of political parties has matured in society. Therefore, a rather large share of the vote (6.04%) was scored by Ihor Smeshko, the former head of the Security Service who practically did not appear in the public space before the election campaign. A major reason for his success was played by the support of a popular Ukrainian journalist Dmytro Gordon. The popular national singer and public figure Svyatoslav Vakarchuk refused to participate in the elections even though he could have achieved a strong result. However, it has now been revealed that he will form his own political party and take part in parliamentary elections. It will be these elections that will determine how effectively the newly elected president and political parties will be able to interact. According to preliminary surveys, Zelensky's 'Servant of the People' Party will achieve a less

Photo: Hronometer



***Zelensky's successful presidential campaign was based on the message that his party "Servant of the People" would put an end to the corrupt oligarchic system in Ukrainian politics by bringing a regular middle class citizen in power.***

impressive result than its leader achieved in the presidential elections. As for Poroshenko, it is believed that the election result shook him up and encouraged him to work on the mistakes he made. He has publicly acknowledged erroneous appointments and even agreed to provide the necessary assistance to his rival after the inauguration process. We should not forget that his term of office saw many achievements such as ensuring Western support in confronting the Russian Federation, strengthening the army, keeping Western sanctions against Russia alive, gaining visa-free travel with the EU, and recognising an autocephaly of the Ukrainian Orthodox Church. And his electoral result of 24.45% of voters can form the electoral core for his political force during parliamentary elections.

## Hopes for General Improvement

What Ukrainians expect from the newly elected President Zelensky is the end of the crisis, cessation of hostilities with the Russian Federation, a return of Crimea, success in the fight against corruption, and a general improvement of citizen well-being. However, this will not happen without hard and routine work. The reality is not as predictable as his sitcom plot.

His dialogue with the Kremlin will hardly be easy. Among Russian experts, it has already been mentioned that President Putin would immediately begin to test the new president, including through the intensification of hostilities in eastern Ukraine. Moscow is also interested in the majority of pro-Russian political parties in the parliamentary elections. After the presidential elections, Russia has already simplified the granting of Russian passports to residents of Donbas, which will be another pretext for 'protecting Russian citizens' in Ukrainian territories.

In general, in contrast to countries that were formerly part of the former Soviet Union, Ukraine has set an example of a democratic change of government and political struggle. Zelensky was able to conduct a non-typical presidential campaign, which gave him the opportunity to beat his competitors in an electoral landslide. Now the main question is whether he will be able to effectively take advantage of the credit of trust given to him by the electorate, and whether he will pursue the same non-standard presidential course.

Photo: MoD Ukraine



***Practical officer training in Ukraine, 7 November 2018. Ukraine is still involved in a simmering war with Russia. It is unclear how the new president wants to mitigate the resulting difficulties.***



# The Austrian Federal Army: Back to the Start?

## A Last-Minute Comment on the Current Political Turmoil in Vienna

**Georg Mader**

Without doubt, the despicable and foolish video showing two drunken and corrupt politicians from the Viennese coalition partner FPÖ, recently published by leading German media, is unprecedented in Austrian post-war politics. As a successful outside "sting operation" which "killed" a national government and led to early elections, a consequence of the scandal has been that all military financing and modernisation steps, which have been painstakingly and, despite much opposition, initiated since the start of 2018, are now left in limbo without losing relevance or urgency.

And, since the shocked and humiliated FPÖ has been unwilling to sacrifice its popular 'anti-migration' minister of interior Herbert Kickl to the demands of chancellor Sebastian Kurz, all their ministers have subsequently resigned, including the esteemed minister of defence Mario Kunasek. It remains uncertain whether he will be able to keep his party's promise to double defence funds by up to 1% of GNP or receive additional funds for long overdue 'big ticket' acquisitions. It is very much unclear what will happen now until a new government is appointed by December.

### A Foreseeable Downturn

The young Chancellor Kurz will achieve good electoral results at the ballot box in September, given his courage in dropping the discredited FPÖ. He and his party, the ÖVP, will continue to focus on zero new debt, which, in fact, was only recently achieved for the first time

### Author

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

Photo: MoD Austria



***Austria needs to decide how to proceed with its fleet of Eurofighter TYPHOON.***

in decades. They are aware that defence issues - with the exception of disaster relief - are not a high priority among the population and the majority left-wing leaning media. Most Austrians have never taken the military aspect of neutrality seriously, no matter to what extent the 'Founding Fathers', in Moscow 1955, had conceived this concept along Swiss lines. For example, Austria has 84,000 sq km and 15 jets while Switzerland has 41,000 sq km and 50 jets.

The officers around Chief of General Staff Robert Brieger would be delighted if they were able to maintain the urgently needed growth rates of 2016, which add up to the highest financing ever - €2.3Bn. From 2021 onwards, however,

the curve shows a downturn once again. It remains to be seen whether the "dark times" of 2007 until 2016 will return, when the military had to 'swallow' budget cuts of €571M due to a broad package of austerity measures introduced in the wake of the European financial crisis. These cuts forced the decommissioning of 750 older armoured and wheeled vehicles and artillery over the past decade. During this period, 41% of air and rotorcraft, 62% of heavy weapons, 60% of protected and armoured vehicles and 56% of unprotected vehicles were decommissioned. The number of workers fell by 16%, with mobilisation falling by as much as 50% and the annual share of conscripts by some 47%.



### A New Interim Defence Minister

As of 3 June, MjrGen Thomas Starlinger (56) will be the new interim defence minister in Chancellor Bierlein's "transitional government of experts". In 2017 he became military adjutant of Federal President van der Bellen. Prior to that, Starlinger was deputy Chief-of-Staff in the multinational command "Operational Leadership Intervention" in Ulm for four years. He was therefore responsible for current geopolitical developments in the Balkans, the Middle East and Africa as well as for migrant movements from the East and South towards the EU. Following a General Staff course from 1997 to 2000, Starlinger served as Chief of Staff and Deputy Brigade Commander of the 7th Infantry Brigade. From 2003 to 2007 he was with the Austrian military mission to the EDA in Brussels. In December 2007 Starlinger became commander of the same 7th brigade in Klagenfurt. From November 2008 to May 2009, he assumed command of the Multinational Task Force South in the KFOR mission in Kosovo. Further stations took him to Syria, Cyprus, Iran and Tajikistan. Prior to a successful referendum in 2013, that maintained conscription, Starlinger was a well-known advocate for abolishing conscription and introducing a professional army in Austria.

Militärkommando Kärnten



### Right-Wing Infiltration?

Since the inauguration of this government before Christmas 2017, the left-wing opposition has always been afraid that handing over both armed executive bodies to the FPOE would lead to right-wing infiltration. And, just at the beginning of May, there were new concerns about military liaison officers in other federal ministries. This has caused astonishment and criticism. Liaison officers are deployed in the offices of the Chancellor and Vice Chancellor offices and in the Ministries of Finance, Infrastructure, Foreign Affairs, Interior and Education - but not necessarily on the ground and/or on a full-time basis. Originally introduced during the Austrian EU Presidency in 2018 to improve interdepartmental co-ordination, these officials remain in place and are expected to be deployed more intensively in the future. Military liaison officers have previously served temporarily in connection with certain events and there has always been one in the Office of the Federal President as Commander-in-Chief of the Bundeswehr. However, the fact that Mr. Baumann previously held senior positions in the Federal Intelligence Service and that the Ministry of Defence is in the hands of FPOE has now made this a sensitive issue. The MoD claims that this closer link between ministries will quicken decision-

making processes with the participation of two or more ministries and corresponds to the idea of 'comprehensive national defence', the guiding principle of Austrian defence - at least in theory. Connections have the potential to be a step towards the realisation of this concept, which envisages national defence not only as a matter for the armed forces, but for all political, economic and social public institutions. However, the opposition parties suspect ulterior motives lay behind the move, warning against both infiltration and espionage. A constitutional expert has warned that the aim of this new role could be to obtain information for the Bundeswehr and questioned the legality of this move. This shows that the MoD has also moved into the focus of those who are now cheering on the collapse of the current centre-right model.

### Remaining a Trustworthy Partner

In spite of all this turmoil, the Austrian forces are still a trustworthy ally in many multinational missions and bilateral agreements, the increase of the Austrian contingent in Mali being a vivid example. Since 4 June, a total of 47 Bundesheer personnel will have been deployed to Mali as part of the European Training Mission Mali (EUTM), which will be under Austrian command. Its objective is to

train the Malian army in the fight against Islamist and Tuareg insurgents. The incoming commander Bgdr Habersatter will oversee the Bundesheer's fourth-largest mission abroad, after Kosovo/KFOR (>400), Bosnia (>300) and Lebanon/UNIFIL (<200). With a total of 1,028 personnel deployed abroad, the Austrians are maintaining a traditionally large footprint overseas in relation to their size. It is also important to mention a recent joint exercise between Austrian and US military police where a binational, company-sized element went through different training scenarios. The overall aim was to enhance interoperability and to work out communication protocols and procedures for international deployments.

### Back to the Old structure

When it comes to their structure, however, the Austrian forces have become 'normal' again, since the 2019 structural reform became effective only by 1 April 2019. The ill-fated so-called 'LV 21.1' reform from a year ago has been rolled back and the extra Air and Ground Forces Commands made way for a unified upper command, led by a three-star general in an effort to further centralise command structures. The Bundesheer operated under such a 'Joint Forces Command' (at Graz) until 2016. However, the actual extent of this change remains to be seen. It was perhaps not really a decisive change, but only part of the general reform 'frenzy' in which the military - and not just the Austrian - constantly finds itself, as current defence ministers reverse the reforms made by their predecessors. Only the Austrian Air Force (now again only a staff element) has protested against this move, angry to have lost their short-lived independence from the 'aardvarks'. As the most expensive branch, they have asked who advised Minister Kunasek to retitling an engineer "Air Chief".

What will become of Minister Kunasek is completely an open question. In fact, who will replace him and by which party is actually a matter of no concern. This is because the new minister and all heads of government will, nevertheless, have to deal with geopolitical conflicts, international terrorism, organised crime, cyber risks and hybrid conflicts involving state and non-state actors. These internal and external threats pose growing challenges to all government agencies involved in providing security and defence protection to the public.



## The Endless TYPHOON Squabble

Despite of all this turbulence, Viennese public prosecutors believe that, contrary to public expectations, there is little basis for initiating criminal proceedings against the €1.7Bn Eurofighter TYPHOON purchase, of which Austria became the launch export customer some 15 years ago. In an internal meeting held on 1 April, which only became public because of an internal document that was leaked by the news platform 'Addendum' (a product of Red Bull founder Didi Mateschitz), two public prosecutors stated that there was no sufficient legal reason to open the investigation in 2017.

At that time, the former Defence Minister Hanspeter Doskozil (SPOE), together with the Austrian financial prosecutor Wolfgang Peschorn, initiated the investigation, claiming that former EADS executives had "cheated Austria of supply capability, equipment and hidden costs for many years." However, contact with ESD at "Addendum" confirmed that a prosecutor at the (unusually recorded)

meeting said he "had difficulty understanding why the investigation was opened at all."

After the controversial meeting was publicised, the public prosecutor's office, which has been conducting the Eurofighter investigation since February 2019, is now openly accusing the Secretary General in the Ministry of Justice, Christian Pilnacek (OEV), of abuse of office for having demanded that the case be closed quickly.

The Procurator General's Office, a body which oversees prosecutors, confirmed it had received a complaint. In response, Mr Pilnacek has rejected the accusation, saying on public radio that "the question at the meeting was how to make best use of the results we have collected to date, or to bring the case to an end. There was a lack of willingness [at the special prosecutors' side] to understand that viewpoint. But I was not asking to 'simply' turn it down!"

The Austrian Air Force is suffering from all this delay. The ongoing third parliamentary inquiry has caused the now outgoing centre-right government to once again sit tight. Chancellor Kurz (OEV) originally

wanted to have a fundamental decision made this summer as to whether Austria should either phase out its EUROFIGHTER fleet or upgrade it. However, the MoD (FPOE), who is now also outgoing, said that a "timely solution is needed, as the life span of the 12 remaining 70s of the Saab-105 jet trainer in Austria, which works alongside the 15 EUROFIGHTERS in air policing, expires at the end of next year." Austria must, therefore, decide whether to continue using two fleets of jets for air policing or switch to one type. In view of the financial situation and current political rifts, however, the latter seems increasingly unlikely.

At the same time, and according to ICAO regulations, the Austrian EUROFIGHTERS will also have to operate a new IFF Mode S/-5 transponder after 2021. At an expected cost of around €500.000M per aircraft, the materials authority of the MoD is currently waiting to see which of the models the four core nations will choose. Allegedly, the German Air Force is very relaxed on this matter, and if no fleet-wide decision is to be expected, Austria would turn to Leonardo's model of equipment. ■

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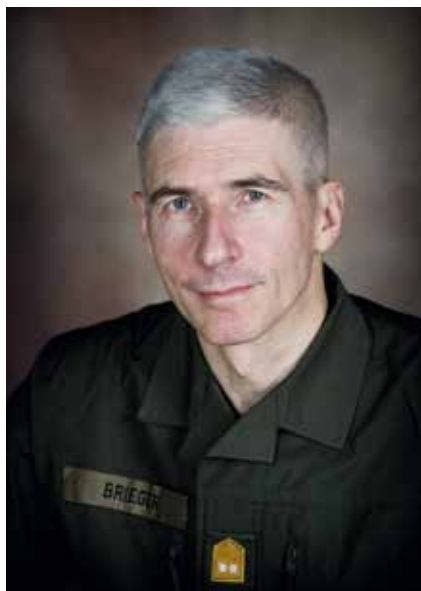
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# “With 0.5% of GDP, we cannot even achieve rudimentary military defence.”



**The Austrian Head of the Defence Staff, General Robert Brieger, talks to ESD about what he has encountered and what he has been doing for the drained army of the wealthy neutral country since taking office a year ago.**

**ESD:** General, first of all, I would like to ask you an international question: during the current EU Parliament Election campaign here in Austria,, and also in other Member States, the issue of a future EU army was raised several times. Do you consider this issue to be realistic or feasible?

**Gen. Brieger:** Neither - nor. It does not pop up for me but you have described it correctly. We are a neutral and democratic country in the middle of Europe; we utilise the possible cooperation among NATO-PfP and EU nations to the maximum as we are deeply embedded in all these bodies. And we are happy with that – according to our possibilities. What may happen in 30+ years from now does not help us with today's manifold tasks, and I answer with my minister: No topic for now.

**ESD:** In March 2019, you attracted some public attention by publishing a brochure where you openly pointed out the limits of Austrian military capabilities if everything remains at the current and forecast budget level of 0.5% of GDP, or how high the funds or billions will need to be if we only want to keep the current level or how high if we want to reduce the investment backlog. What prompted you to publish this?

**Gen. Brieger:** I would like to summarise the issue as follows: When I came into this function, I faced the severe challenge around the financial situation of the Austrian Armed Forces on the equipment level and the critical level regarding combat

readiness. For many years now, it had been accepted that this status was unsatisfactory. However, we we military people have become accustomed to this dire funding culture, while emphasising and publicly highlighting what in fact are secondary roles – and not the constitutionally stipulated armed defence of this neutral country and its citizens. I decided to change this strategy and presented - together with Defence Minister Mario Kunasek - a candid look at the status of the armed forces to the public and the media, without groaning or complaining but also not creating a

be done with their armed forces and that, if we maintain the current level of funding, we will soon be at 0.5% of GDP, well below any minimum required to comply with certain basics of military defence.

**ESD:** But today that doesn't mean the classical defensive combat with all means against a comparably armed conventional enemy.

**Gen. Brieger:** No, of course not - not in the classical way. I did not mean that, since for that large-scale conventional defence the Armed Forces are too small

Photos: Bundesheer



**Although the Austrian Bundesheer has a respectable numbers of recruits, a sizable component is not fully combat-capable due to the cut in compulsory service.**

glossy image that all is fine and that we can happily fulfil our tasks. That was the driving force behind the brochure 'Effective National Defence – An Appeal.' Of course, by creating a certain public stir, the brochure had the strategic objective of pointing out to the Austrians that something must now

and also lack certain up-to-date capabilities. But national defence today for example also means securing nationwide critical infrastructure against asymmetrical threats and hybrid attacks, to be expected in 'derailed' or otherwise chaotic times, or under an indiscriminate terrorist



attack. And for that, as we call it 'protection operation' in several locations, we need manpower equivalent to a funding of 1%. If policymakers in their fiscal approach decide otherwise, then the General Staff and advisers to the minister must draw consequences and policymakers must know what risks they are taking if this underfunding continues.

**ESD:** So, was it worth it in the end and what was or will be the outcome?

**Gen. Brieger:** I must say that some reactions have strengthened or underlined my position as no factual or technical arguments against what I said were put forth. In the public reception it was not questioned in substance, but it was understood that here a critical situation has been highlighted, similar to when the director of a hospital explains that he lacks some vital up-to-date technical installations for curing and caring according to their professional integrity. So, there was a broad consensus in the media and in public comments by various decision-makers. Closely related to this, however, is the question of whether what I am asking for is at all realistic in Austrian politics. I then always answer that it is my and our

task to translate the constitutional tasks entrusted to the Austrian Armed Forces into capabilities. These demand a certain amount of quality and quantity of forces. If we are forced to accept or, rather, suffer drawbacks from those amounts, the responsible politicians will have to accept the inherent or connected risks. And that is what we are making clear here.

**ESD:** Meaning, to simply highlight the risks they are taking for the population?

**Gen. Brieger:** Exactly, to let them know the risks occurring sooner or later. That was the intent behind this brochure as the budget negotiations have only now begun.

**ESD:** In May, you were criticised by the opposition Social Democrats for your openness in a parliamentary questionnaire on the grounds that you had 'revealed military secrets'. Was it not exactly the same people who, over a decade, created and ignored this backlog?

**Gen. Brieger:** That is partly right. I do not need to tell you that you can easily find all the capability data in SIPRI, reports to the OSCE, Jane's or Military Balance. At least in Europe, you can today track every piece of equipment, like our M109 artillery pieces

that were sold to Estonia, for example. Or how many vehicles of an obsolete type are still operational.

**ESD:** To me, it seems that since the Ukrainian crisis in 2014, the public mood in Europe, including Austria, has turned away from the zero expenditure policy and returned to the defence of all of us, even though there are still some politicians playing games on the backs of the armed forces. For example, one party is not granting its coalition partner a budget success because its current defence minister would run against it in next year's regional elections. Is this also the impression in the armed forces as a drained institution?

**Gen. Brieger:** You know that in my function I cannot comment on domestic political manoeuvres, no matter how more or less accurate these observations may or may not be. I can only say that for decades we, in Austria, have unfortunately accepted the daily experience of party politics interfering into the planning and financing of the armed forces. And there has always been the contradictory desire to keep defence policy and its instrument to protect the country and its population out of such infighting.

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**ESD:** This is more or less how it is handled in most Western countries, keeping the armed forces out of politics and election campaigns. and so forth.

**Gen. Brieger:** Exactly. There is a consensus in all parliamentary parties that security and defence policy has to stay out of the daily party political infighting.

protect and patrol an international airport like Schwechat within its perimeter, you quickly get to several battalions. It is a highly manpower-intensive mission. Also, you would initially not mobilise but instead try to cover this with available forces, which, of course, are limited. While we have quite respectable numbers of recruits, a large num-

ber operation, for example. It is an assessment of priorities. In general, in any military, it is a reality that when you have four building blocks, like large units, in fact only one is fully available for combat.

**ESD:** This is like warships and aircraft carriers. Only one in three is ready for action.

**Gen. Brieger:** Right. In the form of a construction kit, where you can take the modules you need right now.

**ESD:** Or, in large-scale exercises for example, when units have to borrow vehicles from other units to fulfill their objectives?

**Gen. Brieger:** For example, sometimes, for better co-ordination in such larger exercises, we are now moving along the path to standardising the induction dates during the year in order to have the brigades do their exercises together towards the end of each conscript contingent's service period. In the past, this was a 'patchwork' and the large units are, in effect, no longer brigades anymore but instead only 'force providers'.

**ESD:** Let us talk about border-protection. When you took office, you said in an interview that uncontrolled mass migration is one of the major current threats. That has caused raised eyebrows in some political circles. What did you mean in particular? And when does it become a military question that requires military action?

**Gen. Brieger:** I would explain what I meant by saying that we are currently supporting border protection in the form of assistance to law-enforcement. Furthermore – and this easily draws us into a highly political arena – our approach to security is that if in a society you have a growing share of problematic or hard-to-integrate characteristics, then this can lead to social discord and furthermore, over the medium term, theoretically to law-enforcement operations on a larger scale, to calm or tone down scenarios of – again potential - domestic unrest. Thus, migration as a potentially destabilising factor is listed today in every international threat analysis.

**ESD:** And such threat analyses and strategy papers also shows we can no longer afford the 'luxury' of ignoring many scenarios and potential crises as we could a few years ago.

**Gen. Brieger:** Of course not. The 'end of history', longed for and propagated after the Cold War, has been falsified. That luxury is gone – and all European armies are struggling to cope with that. Especially since 2014, potential threats have tended to develop much faster. There are no warning times anymore, very different players.



*As an alpine country, the Austrian armed forces are competent in mountain warfare, which frequently attracts international military visits.*

**ESD:** Surprisingly, however, in late 2016 there was this all-party parliamentary motion to provide additional funds to the Bundesheer.

**Gen. Brieger:** Yes, this was one such rare case; it occurred also because of the awareness of changed security parameters. But that was a singular effect and it did not translate into a turn-around and meanwhile has been 'consumed'. Hence our appeal to get serious again and to achieve a solid and decent regular budget that is also appropriate for one of the wealthiest countries in the world.

**ESD:** You mentioned the key task of protecting critical infrastructure. Aside an exercise at Vienna Airport, I once was told by an officer that the material and human resources scale to protect Schwechat international airport the country's largest oil-refinery nearby and the close main railway marshalling yard at Kledering, would consume all the short-time available personnel. Yet, there are many more such physical objects in Austria. Is that true and how many forces would we really need to cover all of them?

**Gen. Brieger:** Yes, for that task we would need the equivalent of a brigade. To fully

ber of them are not fully combat-capable, which has to do with the cut in compulsory service [since 2006 from eight months down to six]. Thus, we largely rely on the ready or standing troops, which quickly brings us to the limit. By the way, I am observing this not only in our own forces.

**ESD:** With the current level and strength of troops, what kind of protection could the Austrian armed forces provide for how many critical objects? What numbers of troops could be deployed throughout the country and in what timeframe could it be achieved?

**Gen. Brieger:** Of the ready component of the Austrian Armed Forces, about a brigade equivalent can be deployed within 48 hours. We constantly prove that we can achieve this in various so-called assistance operations in support of law-enforcement. We have over 700 troops – including conscripts – in border surveillance operation. And we have about 1,000 troops in international operations, which ties up certain potential. In an assessment of a situation or crisis, there would likely be a decision to shift forces, as in the event of a domestic terrorist attack, to interrupt or end the





**ESD:** Let us get back to capabilities and force posture. We have collected some figures from various sources about what has been abolished, phased-out or scrapped from your inventory over the last 15 years: 41% of air and rotorcraft, 62% of heavy weapons, 60% of protected and armoured vehicles, 56% of unprotected vehicles. Human resources dwindled by 16%, with the mobilisation number down by even 50% and the annual contingent of conscripts by 47%. Are these figures correct?

**Gen. Brieger:** Unfortunately, these figures are correct, and are the figures I have presented in my brochure. One can use these figures, yes. And, after it was released, for example, I was asked why the number of standing manpower was reduced by only 16%, while there were 60% fewer MBTs. Well, it is hard to explain that even equipment that is not in the first line has to be maintained, skills need to be preserved, and so on.

**ESD:** When it comes to weapon systems, where do you see the largest gaps in the Austrian inventory?

**Gen. Brieger:** First, I would mention protected as well as unprotected mobility. Many trucks are twice as old as their drivers, and it is possible, if only selectively, to procure replacements. The fleets are shrinking even though there is considerable demand. We are also struggling to equip our infantry with protected vehicles. We have been able to equip three battalions but the majority of them currently do not have that kind of equipment. There are deficits in individual combat equipment and in communication equipment like modern radios. Another area that is dear to me are the tracked vehicles, the core of any force. For 20 years, no investment has been made in the Leopard 2A4 fleet, so at least some life-extending measures are needed.

**ESD:** Were these MBTs not subject to modernisation in co-operation with Germany and Switzerland? Which upgrade was or is planned for them? Night combat capability perhaps?

**Gen. Brieger:** Yes, there are ongoing talks about that. The problem is that these steps are so costly that we have come to take such life-extending measures on our own. That is often no big deal, like when it comes to hoses, which have become porous. Or changing the turret's hydraulic drive to an electronically controlled one. There is a need to overhaul the tank gun since the old Rheinmetall gun cannot fire modern ammunition. In such cases, we look for bilateral solutions. Another issue was that cadmium sediments had been found in fuel



*In view of shrinking demographics, the Austrian army is rethinking its fitness criteria: If you do not have the sight of a sniper, you can still work on a computer screen.*

tanks, at least after they had used NATO diesel during some deployments to Germany. And you are right, they need night-combat capability. These steps are necessary to make the tank combat-capable for another 10 to 15 years. Some demand is also reported from the artillery, where, for targetting, we are introducing the meanwhile operational tactical tracker UAV. We have also begun fielding the protected Iveco HUSSAR 4x4 vehicle for the mobile reconnaissance units.

**ESD:** How would you rank the capabilities where the Bundesheer today is 1) very good, 2) on a moderate level 3) has only scientific basic knowledge or 4) is not pictured at all? Things like EW on troop level, mobile air-defence, and so forth.

**Gen. Brieger:** I would not answer that using such categories. Why? Because in all these assessments, one must not underestimate the human factor. And we have very good and capable professional soldiers in most units. Our training is a 'top product', also internationally. In fact, we receive very good marks when it comes to training and the approach to the professional education of NCOs and officers, which results in great capacities of improvisation, down to the individual commander. In international operations, other and larger armies often admire us for that. That being said, we have some branches of the forces where the training level and the equipment quality are better or more up-to-date than in others. This is the case with the NBC defence units versus armour. This means that, generally, our plus is the human capital, which often compensates for equipment that is not state-of-the-

art. We simply have good personnel, otherwise we would not achieve successful daily operations. And thanks to the efforts under [former defence minister] Doskozil, there is more interest in military service and more recruitment of capable personnel. Yet, of course, the point is to provide these young, ambitious 'tech-afficionados' that they are with modern, up-to-date equipment. And with decent infrastructure in the barracks and decent working conditions to keep them in the forces after national service.

**ESD:** Regarding incoming conscripts and their 'potential', there have been reports in recent months that you want - or need - to ease the demands on personal fitness or medical aptitude in mustering the incoming young recruits. So, what is the aim and the reason?

**Gen. Brieger:** Generally, we have a shrinking demography and, of course, the incoming conscripts reflect that. But the number of conscripts considered unfit for service has risen by a quarter [in 2017, 10,204 or 26,3% out of 38,840 conscripts were found unfit]. Therefore, we are reassessing the fitness criteria: If you do not have the eyesight of a sniper, you can still work on a computer screen, just as you do in your private life.

**ESD:** However, of course, there are capabilities or roles where, in an international comparison, there is only basic theoretical knowledge in the higher and specialised ranks, although not at troop level. I would like to emphasise once again the entire EW sector.

**Gen. Brieger:** Yes, as in any army, there are strengths and weaknesses. Being an Alpine country, we are very competent in



mountain warfare and operations. Foreign armies are continuously coming to see and learn from us about that. For decades, we have had bi-annual helicopter mountain flight training, where foreign forces send pilots and sometimes helicopters too. That is very demanding for crews otherwise flying only over sea or desert. And let me highlight here the sector of cyber defence and warfare, where we have – with our very limited resources – established a level

of accounting, where I was told that we should set sound priorities, and then we would manage with our budget. That is the impression some people have. On the other hand, I have the impression that it has become known at the highest fiscal level that large-scale procurements cannot be funded by our meagre annual budget. But regardless of more or less accurate impressions, the General Staff is requesting a rise of military funding from the current €2.2Bn

we cannot even achieve rudimentary military defence. We have also illustrated in the booklet what can be expected from what figures, and what cannot be expected.

**ESD:** This brings us directly to the postponed decision on the future of the 15 EUROFIGHTER Tranche-1s that have been operating from Airbase Zeltweg since 2007. The current Defence Minister Kunasek handed over his report on another commission to the political level of the current coalition a year ago, which, however, held him back. Now it is no longer up to the MoD to decide whether to modernise EUROFIGHTER, drop it or replace the old Saab trainers. But I am sure that you had to make some fundamental considerations on this rather expensive question.

**Gen. Brieger:** Oh yes, while this is or will be a political decision, some basics cannot be left unmentioned. With all variants, there is the need to calculate all life-cycle costs. That was the mistake with the EUROFIGHTER; after delivery of the first EUROFIGHTER, their instalments and running costs were suddenly included in the annual budgets by a following government – contrary to what had been agreed earlier. Nevertheless, especially a neutral country has to take care of its own sovereign airspace. We cannot leave this task to others, as some NATO countries like Slovenia and the Baltic States do. The other week, I was invited to Switzerland to Payerne by my Swiss colleague KKdt. Rebord. They take this task very seriously.

**ESD:** There, at Payerne, the in-country evaluation for the renewed Swiss fighter programme is going on now. Did you get any insights?

**Gen. Brieger:** No, not when it comes to evaluation details. However, what I have noted in general was that one can do much more with €4.4Bn than with €2.2Bn. And we have heard that the Swiss Air Force will in the near future raise its QRA readiness to 24 hours/seven days.

**ESD:** This means that we are the last country in Europe with a fleet unable to provide QRA readiness, right?

**Gen. Brieger:** Yes. But that extended mission we cannot achieve with the Eurofighter today. We would need to do an upgrade and we would need to fly considerably more fleet hours than we do today. And we would clearly need more pilots than today.

**ESD:** 'Pilots' is the buzzword for my next question. While any composition of the future active air-surveillance components will be a political one by any coalition government, is it right that it is impossi-



**The Austrian fleet of tracked vehicles needs to be renewed as there has been no investment in the LEOPARD 2A4 fleet for 20 years.**

where we have repeatedly won 'cyber challenge' competitions and are decently able to protect our networks. Thus, while there are top marks in some sectors, there is hardly any weapon system in our arsenal where there would be no need for smaller or larger upgrades or improvements.

**ESD:** This brings us back to the dire budgetary situation, which is the result of widespread illusions among politicians and the media. While Austrians drive to SATURN for every latest technical gadget, the defence sector of the EU's fourth richest country has to continue with 50-year-old systems, such as the helicopter ALOUETTE-III or the jet trainer Saab-105OE, or with 0.5% of GDP. European defence budgets average at around 1.4%, which means that Austria would have to spend more than twice as much just to reach the average of its neighbours. Is this realistic, or does it give the impression that the military is of no interest to political decision-makers - no matter which party? Can you still be disappointed?

**Gen. Brieger:** I must admit I am a trauma patient when it comes to the treatment of the Austrian Armed Forces. Ever since I was a lieutenant, we have always had shortfalls. We discussed guided weapons decades after their introduction on the battlefield. Just yesterday, I had an appointment at the Ministry of Finance on the dry subject

to a minimum of €3.3Bn by 2022, or an annual budget of €2.7Bn, plus approximately €400M for extra procurement investments, and from then on a minimum of 1% of GDP, for example, €4Bn just to cover the most pressing needs to get the armed forces to an up-to-date level.

**ESD:** I am sure some of my fellow journalists have asked you what you will do if these well-calculated and illustrated questions continue to be ignored. What can you do to highlight the shortfall? Would you then propose at the political level that it tells the people that military defence should be removed from the Constitution?

**Gen. Brieger:** One should not scare the general public that may be more insecure than in the past. But with the necessary insistence and tenacity, I have to clearly point out to individual decision-makers, who have sworn an oath to protect the constitution and the population who elected them, that underequipment and understaffing of the Armed Forces does come with considerable risks. If we are unable to protect high-level summits or comparable large-scale events, politicians need to know this. If we are unable to respond to a large-scale terrorist attack, politicians need to know this. Changing the constitution is a political decision; the military has to illustrate faithfully the status of the available forces. With 0.5% of GDP,



**The Austrian Armed Forces are currently supporting border protection measures of civilian law enforcement authorities; depicted is an exercise at Spielfeld, 26 June 2018.**

ble to shift the 40% fortnight share of air-policing shouldered by the 12 remaining 1970s Saab-105 to the 15 EUROFIGHTERS with the same number of pilots and not doubling their annual flight hours? The 14 Czech GRIPEN at Caslav for example, are flown by 28 pilots!

**Gen. Brieger:** Yes. Without any substitute aircraft, the air surveillance will, of course, become further limited or restricted. Just the opposite of what we said about Switzerland.

**ESD:** And that will not be alleviated or straightened by possibly two or three ex-German EUROFIGHTER two-seaters. That means from the view of human potential, there is a need for a second much cheaper and modern platform.

**Gen. Brieger:** Correct, such two-seat fighters would not really help. If you look at the issue economically, saving precious and costly flying hours in peacetime air surveillance by bringing it down from the supersonic element into a second fleet would be a good solution, because technically and from a maintenance perspective, our centre at Zeltweg is indeed able to deal with such systems. We have surprised German Air Force guests with the level of what we service on the EUROFIGHTER on our own and how cost-efficiently we operate that system. We have successfully stretched check intervals according to our flying hours penum, we do not send the ejection seats to a German company but service them ourselves.

**ESD:** When a new administration might finally commit to a variant including a small number of modern substitute trainers, would it not be too late? Initial deliveries following a contract take two years or more. Is the deadline for retiring the '105s'

still the 1 January 2021? Is there flexibility remaining to stretch that?

**Gen. Brieger:** I rule that out. End of service is at the end of 2020.

**ESD:** When will the so-called 'mobilisation package' announced last August lead to the launch of an RFP for the 12 to 14 light multi-role helicopters? The extra funds have been granted, right?

**Gen. Brieger:** Yes, they are granted. And, in parallel, there has been a wide-ranging request and questionnaire to friendly nations – including Canada from what I have heard – and the answers are now being evaluated. We aim to have a relatively swift selection process following government-to-government (G2G) principles.

**ESD:** G2G means to speak only with foreign governments without a tender for an open competition of manufacturers, right? However, I have heard from some manufacturers that they have doubts about how this should be done in detail, because in the end you have to talk to the manufacturers of the helicopter or any other item. And only Sweden and the US have their own defence export agencies for their equipment. Armies can only sell used or superfluous equipment, but not newly produced technology.

**Gen. Brieger:** Based on what we experienced with the EUROFIGHTER procurement, there is now a preference for government-to-government. We are investigating the options as there are several. We have sent various enquiries to partners, and the answers are now being evaluated by our directorate-general for armaments. I am convinced we will see results shortly. Regarding the type, I want to point to the example of the PANDUR APC. Here, we procured a certain number – and we then

passed a part of that number on to Slovenia, since they had selected that type. The prerequisite is that a partner nation – like for example Italy – procures a particular item and then passes it on to us. That is government-to-government.

**ESD:** For a long time, the Austrian military structure placed aviators under the the army or an air force staff in the joint forces command. In 2017, new Air Force Command was created, which was recently revoked by the current Minister with the ill-fated LV 21.1 reform. I have heard people criticise this 'downgrade' and say that it is only a political step to create a new name tag. Did you hear that too?

**Gen. Brieger:** Partly. Yet, this is an emotional thing. I am sure that the Austrian military pilots do an excellent job every day, no matter where they are on the organisation chart.

**ESD:** There is a problem with human resources, with a shortage of pilots and technicians on the AB-212 helicopters at Linz-Hörsching. Reportedly, one squadron is down. Why is that?

**Gen. Brieger:** Because on the one hand, personnel are leaving for the private sector, and on the other hand, it is difficult to replace them because we have a rather stringent selection process for pilots, with a lengthy assessment procedure. The separation between jet, fixed-wing and rotary-wing assignments happens relatively late in the process. Trainees sometimes feel that it takes too long, which is another issue we need to fix. While pay allowances have been raised, but there are also personal issues, such as individual work-life balance.

**ESD:** When does the first S-70 BLACK HAWK return from Alabama where 'Ace Aeronautics' has been upgrading cockpit displays, NavAids, NVG-readiness and comms systems?

**Gen. Brieger:** We do not have an exact date yet, but it should happen this coming autumn.

**ESD:** Is there anything to consider regarding the Pilatus PC-7 TURBO TRAINERS? They are 36 years old.

**Gen. Brieger:** These are not in a critical condition as far as the stress on the airframe is concerned. There may be some regulation-driven updates, but currently there is no urgent need to take any steps.

**ESD:** Thank you for the interview, General.

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

# The World Market Leader in Niches

Georg Mader



Currently, more than 100 Austrian companies are working in the security and defence sector, employing about 32,000 staff directly or indirectly. They generate an annual turnover of approx. € 2.5Bn.

With an export share of more than 90% – also due to the persistently underfinanced national army – the industry is at the top of an already strong Austrian export industry.

Austrian security and defence companies – partly in joint ventures, partly foreign owned – offer a broad portfolio of products, services, technologies and technical expertise to meet the ever growing technical, technological and engineering demands. Their portfolio consists of the following areas of technology:

- Automotive & accessories
- Non-jet aerospace/surveillance platforms (manned/unmanned)
- Weapons & ammunition
- Personal defence equipment
- Information, communication and cyber technology

Austrian companies have system and component expertise in all of these areas. In addition, they also offer certified engineering and consulting, as well as certified testing and experimental services and facilities. Most of the companies, however, are designing and producing so-called "dual-use" products, used – often as suppliers – in military and civilian sectors or, as the Austrian Federal Economics Chamber (WKO) puts it "Technology leadership, customer orientation, an excellent level of quality and the ability to provide innovative and tailor-made solutions justify the global competitiveness of Austrian players in the strategic security sector."

## Research and Development

With investments of more than 3% of GDP in research and development – two-thirds of which are directly financed by companies, with an upward trend – Austria is the European Leader in this sector. And, since 2005 with the national security research programme KIRAS (which also covers dual-use products) and the co-operation projects promoted by it, Austria has pursued a holistic approach with a close exchange

between consumers, research centres and companies. With public funds amounting to around €80M to date, KIRAS has supported some 232 projects, the results of which have been used to develop a range of commercialised products and services for the security market. Austrian companies and research institutions, which already have national research experience, are often welcomed as partners in projects of the European Security Research Programme.

Regarding special defence research, although Austria is still at the beginning of its activities for a national defence research programme, co-ordinated and close co-operation with KIRAS will hopefully soon lead to the first successful projects and resulting technologies in this field.

## Austrian Security and Defence Industry

"ASW" has nothing to do with the "anti-submarine warfare" as the last Austrian submarines were decommissioned in 1918. Today, ASW stands for "Austrian Security & Defence Industry Group", which acts as the national association of the security and defence industry. As an organisation within the WKO, ASW is a specialised lobby group, promoting the interests of the Austrian security and defence industry, supporting the international visibility of Austrian companies and their skills and knowledge in security and defence technology. They are trying to position Austrian companies as innovative, qualified and competitive providers on a global market.

## A "One-Stop" Shop

ASW's main objective at present is to act as a "one-stop"-shop for Austrian manufacturers and suppliers in the security and

defence technology sector by bringing Austrian expertise to international attention in order to generate an exchange of information about potential customers, business partners and opportunities and to promote cross-border co-operation with OEMs and their supply chain in the areas of research and development, qualification, system supply and operation.

To bring together the national and international demand for products, services, technologies and "know-how" and to support the Austrian security and defence industry, ASW offers free of charge services by identifying and introducing co-operation opportunities and business cases, facilitating the exchange of information between customers and potential partners, establishing contacts between business partners for individual exchange, supporting the distribution of information material at major international trade fairs and exhibitions and co-organising special events, briefings and workshops, for example site visits, in and outgoing missions and showcases.

## Networking

Together with the supporting members of the association – the WKO, the Austrian Associations of the Metal Technology Industry, the Automotive Industry and Electrical and Electronics Industries and the Federal Foreign Trade Commission – the ASW operates a strong and extensive network reaching out to all Austrian companies operating in the security & defence sector. Working closely with the network of 'Advantage Austria' – the foreign trade promotion organisation for the Austrian economy, ASW offers tailor-made support to worldwide potential partners, customers and suppliers. ■





Images courtesy of JGSDF, JMSDF and JASDF Official Website  
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# NATO and Georgian–American Military Relations

**Eugene Kogan**

Since the 2003 Rose Revolution, Georgia has become a staunch and dependable non-NATO ally of the United States in the South Caucasus. Georgian-American bilateral military relations have become stronger and have climaxed in November 2017.

With 870 soldiers per capita, Georgia is the leading donor of troops in Afghanistan. This is highly appreciated by the United States. James Mattis, US Secretary of Defense, said on 13 November 2017: "Georgia is a role model for all" NATO

training the Georgian military for the Afghanistan mission and began training the Georgian military for the territorial defence of Georgia in May 2018. Georgia's acquisition of JAVELIN portable anti-tank systems in January 2018 was indeed a milestone

## US Financial Support to Georgia

American military assistance to Georgia, designated the FMF and intended for military equipment, fell from US\$30M in 2016 to just US\$20M in 2017, with funding in 2017 aimed at "promoting the development of Georgian forces capable of enhancing security, countering Russian aggression and contributing to coalition operations". This also includes support for the modernisation of Georgian rotorcraft air transport capacities, Georgian military institutions and defence reform. A spending law passed by the Senate Administrative Committee in September 2017 increased Georgia's FMF from US\$20M in 2017 to US\$35M in 2018. And we can expect a further increase for 2019, although the official FMF data have not yet been published.

## A Turn in the US Military Approach

In recent years, the US military approach to Georgia has shifted – from training for international missions to the territorial defence of Georgia. The latest US-Georgia "Memorandum on Enhancing the Defence and Security Partnership", signed in Tbilisi on 6 July 2016 by US Secretary of State John Kerry and Georgian Prime Minister Giorgi Kvirikashvili provided for this shift of US military assistance to Georgia from training Georgian soldiers for international deployment to the territorial defence of Georgia. In addition, the memorandum provides for assistance in defence procurement for Georgia in order to enhance the country's defence capabilities and the combat level of its armed forces so that they can cooperate with NATO forces. The initiative focuses on modernising Vaziani military base outside Tbilisi in order to better deploy Georgian forces in combined



Photo: U.S.M.C.

*The US holds two major military exercises annually on Vaziani military base – Agile Spirit and Noble Partner. Depicted are Georgian, US and Azerbaijani troops during the opening ceremony for Exercise Agile Spirit in Orpholo, Georgia, 3 September 2017.*

member states deploying forces in Afghanistan. And the United States responds accordingly, not only with regard to foreign military funding (FMF), but also with regard to the annual US-led military exercises in Georgia (codenamed Agile Spirit and Noble Partner). In addition, US instructors are

in relations between Georgia and the US. Up until then, the US did not deliver defensive weapons to Georgia. This development has consolidated bilateral relations, taking them to a new level. Finally, with the pending Georgia Support Act (GSA), introduced on 26 June 2018 by the Congressmen Ted Poe and Gerald Connolly, the US provides robust support for Georgian sovereignty, although it does not provide details of emergency assistance to Georgia in the event of a Russian invasion. In other words, in a conflict with Russia, Georgia has to defend itself on its own.

## Author

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



arms operations or to improve cooperation between ground troops and air support. For example, during the 2016 Noble Partner Exercise Georgia commanded joint Georgia/USA/UK air and land forces for the first time.

The US does some combined arms training of Georgian troops, but it does so at the US-operated Joint Multinational Readiness Centre at Hohenfels Training Area, Germany. The establishment of the US-financed Joint Multinational Readiness Centre (JMRC) in Georgia, similar to the centre of the same name at the US site in Germany, is a step in the right direction. The US-Georgia JMRC is located at Vaziani military base and has been in operation since May 2018.

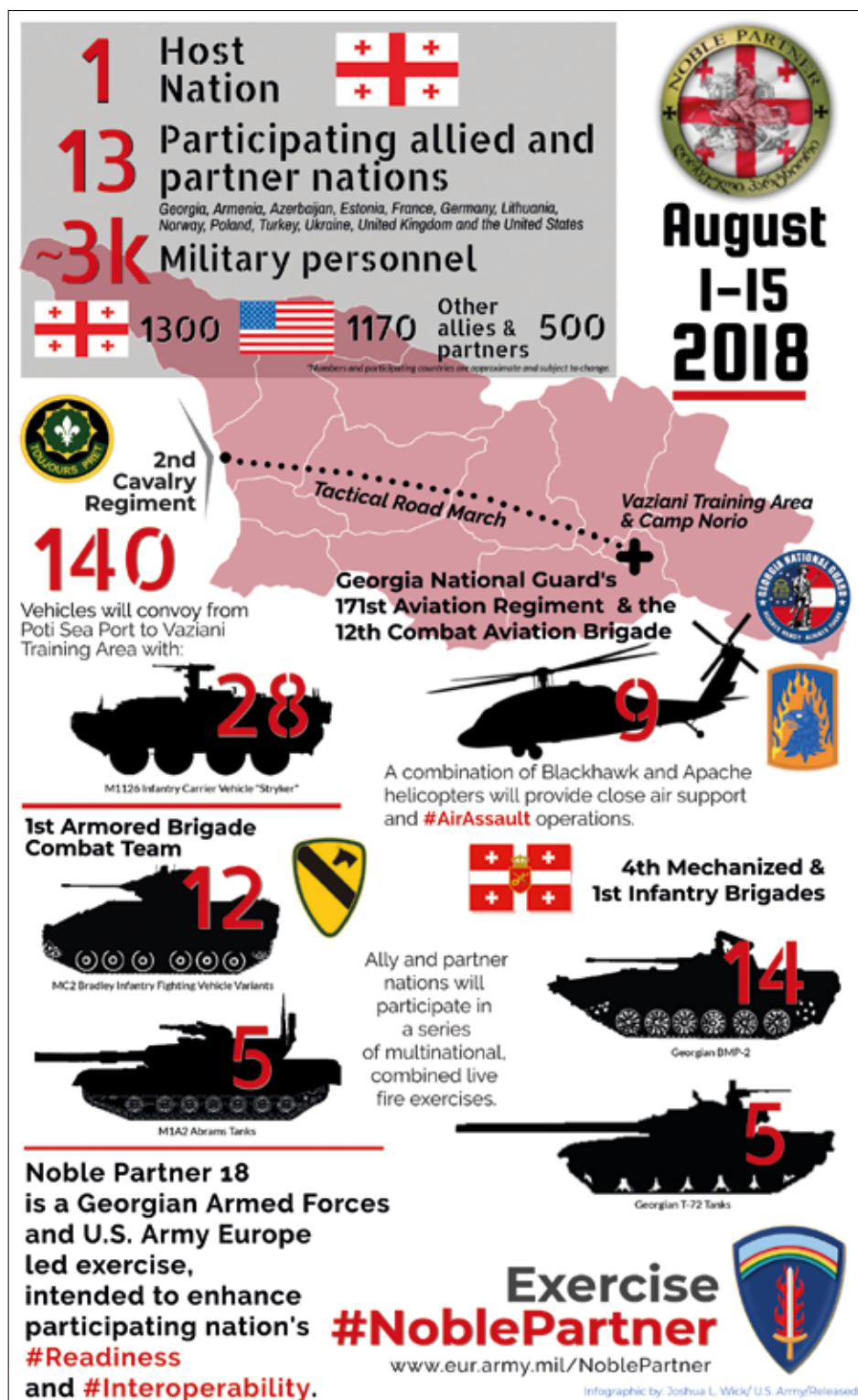
Under the Georgian Defence Readiness Programme (GDRP) launched at the JMRC, between 40 and 50 American army officers are stationed at Vaziani base to train Georgian troops. The programme was launched in May 2018; it has a duration of three years and trains nine NATO standard rifle battalions. This complements Georgia's operational programme, under which some 80 US Marines are stationed in Georgia to train Georgian troops before they are being sent to NATO's Resolute Support Mission (RSM) in Afghanistan.

In addition to training, the United States has finally approved the supply of defensive weapons to Georgia. Currently, the US holds two major military exercises annually on Vaziani military base – "Agile Spirit" and "Noble Partner", a point which has repeatedly drawn criticism from Grigori Karasin, Russia's Deputy Secretary of State. Karasin said in February 2019, "NATO's agenda is becoming more and more visible in Georgian foreign policy. They quite often hold large NATO military exercises, and Georgia is getting involved in other countries in the region, such as Armenia. Georgian politicians speak of an accelerated NATO membership strategy and an alleged Russian threat to democratic Europe". The military exercises have become a real irritant in Russian-Georgian relations.

### Georgian Procurement of US Defensive Weapons

The US Defence Security Cooperation Agency (DSCA) announced on 20 November 2017 that "the State Department has approved a possible Foreign Military Sale of JAVELIN missiles and command launchers to Georgia for an estimated cost of US\$75M". In January 2018, the sale was approved.

DSCA specified that arms sales would include 410 JAVELIN missiles and 72 JAVELIN Command Launch Units as well as logis-



*Thirteen nations participate in the annual Noble Partner exercise. Agile Spirit and Noble Partner are multilateral training exercises designed to promote unit cohesion and interoperability between the United States, Georgia, and other NATO and partner nations.*

tics and programme support elements. According to DSCA, the proposed sale "would contribute to the foreign policy and national security of the United States by enhancing the security of Georgia. The JAVELIN launcher system will improve Georgia's capability to meet its national

defence needs." DSCA also noted that the sale "would not alter the military balance in the region" and that "there would be no negative impact on US defence as a result of this planned sale". What is important in the DSCA Declaration is the explicit link between the foreign policy and national



Photo: US Army / LANDCOM Public Affairs



**The logo for the NATO-Georgia Exercise at the NATO-Georgia Joint Training and Evaluation Centre in Krtsanisi National Training Centre**

security of the United States and the enhanced security of Georgia. It underlines Georgia's importance for US foreign and security policy and underlines the American understanding that such a limited sale of defence systems to Georgia would not be a turning point. At the same time, the US signalled to Russia that it was willing to supply defensive weapons to Georgia, a signal which was perceived in Moscow. The sale of JAVELIN anti-tank missiles is therefore a milestone in relations between Georgia and the USA. Until the announcement of the DSCA, the US Government hesitated to sell defensive weapons to Georgia, because Georgia was not seen

as a responsible actor on the international stage and in order not to aggravate the unsafe relations between the US and Russia and because of an unofficial arms embargo against Georgia after the war of August 2008. Undoubtedly, the illegal Russian annexation of the Crimea in March 2014 was an additional factor that prompted the US Government to reconsider and eventually sell JAVELINS to Georgia. Whether the US will sell more JAVELINS or not remains to be seen. However, such a sale is no longer completely unlikely. The Trump government has revitalised military relations between Georgia and the US, which had been neglected by the Obama administra-

Photo: US Army



**At Vaziani Training Area, a platoon of Georgian Army BMP-2 infantry fighting vehicles firing during a combined arms live fire exercise with US troops. The exercise was part of Noble Partner 18.**

tion. Furthermore, in 2017, the US began replacing Soviet AK rifles in the Georgian Army with American M240 machine guns. Besides JAVELIN missiles and M240 guns, Mamuka Bakhtadze, Prime Minister of Georgia, said in October 2018, "American specialists are ready to upgrade US helicopters donated to Georgia." Already in 2001, the USA donated 10 Bell UH-1 IROQUOIS helicopters to Georgia. One of the helicopters was lost; two are still in use, and seven more are to be retrofitted. It is still undecided whether the USA will donate more of the Bell UH-1 helicopters to Georgia.

## Vaziani Military Airfield

Last but not least, in November 2018 Levan Izoria, Georgian Minister of Defence, welcomed General Stephen Lyons, Commander of the United States Transportation Command (USTRANSCOM). The talks focused on expanding the capabilities of Vaziani military airfield. Izoria said: "We want to strengthen ongoing cooperation and implement the initiative we have presented to the NATO Georgia Commission (NGC) to implement the Georgian Defence Readiness Programme. To this end, we need adequate infrastructure capacity and a key component is Vaziani military airfield".

The Russian newspaper "Voenno-Promyshlennyy Kurier" reported that Vaziani Airbase, which in Soviet times housed a Soviet military airbase, might once again become a military airfield, but this time an American one. The Russian newspaper "Kommersant" further stated that Georgia and the US had agreed to build a large NATO military logistical hub on the basis of the existing Vaziani airport. After modernising the runway, American HERCULES transport planes would be able to touch down in Vaziani. The modernised airfield would be used for deploying NATO troops for military exercises in Georgia, but it could also be used to deploy troops in the event of an escalation in Georgia. It is not yet known when construction will begin and how high the costs will be.

However, it is premature to consider modernising Vaziani Airport and upgrading it from Vaziani to a large NATO military logistical hub as a sign of a fully-fledged US military base in Georgia. What is happening at the moment, however, is indeed a first step in this direction.

However, it is important to consider the Russian perspective. President Vladimir Putin and his military advisers are likely to react militarily if the proposed plan is implemented. They regard Georgia as their zone of influence and are not prepared to hand Georgia over to the Americans. The

US military planners should take this point into account, as the implementation of the above plan would give Putin and his military advisers a licence to invade Georgia to take over or destroy the US military facilities and expel American and NATO instructors from Georgia. Such a scenario is not far-fetched. We must remember the famous SAS motto "He who dares wins", and Russia's recent military invasions of Crimea and Syria clearly show that President Vladimir Putin's government is not afraid of unknown dangers and is ready to respond to its well-prepared plans. It should be stressed that Russia's soft security policy is supported by the robust military arm, a fact that the US military should be aware of, along with Russia's willingness to invade other countries.

According to US estimates, the war between Georgia and Russia in August 2008 led to the destruction or loss of around US\$30M in donated materials and equipment. Next time, costs are likely to be higher.

In addition to military support, the US has been providing support for the Georgian Coast Guard since the end of the 1990s. The Georgian Coast Guard, which reports to the Ministry of the Interior, was merged

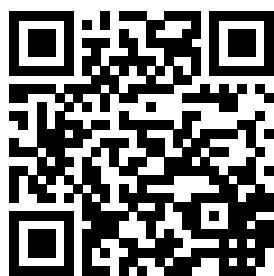
with the Georgian Navy in 2009. On 30 September 2016, the US donated two ISLAND class patrol boats to the Georgian Coast Guard. The Georgian crews were trained for 10 weeks by the US Coast Guard in Baltimore, Maryland. Since the August 2008 war, the US has financed four radar stations for the Georgian Coast Guard – in Gonio, Anaklia, Supsa and Chakvi. The two previous radar stations were destroyed in August 2008. The US also financed a maritime fusion centre in Supsa and a ship repair facility in Poti, which were opened in 2014 and 2013 respectively. Finally, in September 2015, a new Coast Guard boat pool was inaugurated in Batumi, built with US\$14M from US funds.

There is no doubt that US support for the Georgian military is a source of hope for Georgia's possible accession to NATO. Georgia's ability to provide a relatively large number of well-equipped and well-trained troops in the event of a national emergency will demonstrate to the NATO Alliance that Georgia is a vital partner. A country able to defend its interests with or without the Alliance is worth NATO membership, even if some NATO members are not yet convinced of Georgia's value and follow their natural instincts not to obstruct Russia.

## Conclusion

Georgia's military involvement in the US missions in Iraq and Afghanistan demonstrated the determination of a small country to be at the forefront of US combat operations. The 32 Georgian soldiers who died in Afghanistan in the last 10 years were seen by the US military as brothers in arms, and their deaths strengthened the link between the militaries of both countries. It is for good reason that Congressman Ted Poe said on 26 June 2018: "The friendship between our two nations has been forged in blood, with Georgian troops fighting and dying alongside American troops in Iraq and Afghanistan." The abovementioned initiatives show that a viable Georgia is crucial for the United States and its strategic planning in the Black Sea region. Georgia's military progress since the August 2008 war should encourage wavering NATO members to reconsider their stance on Georgia's NATO membership. The official NATO approach "More NATO in Georgia and more Georgia in NATO" is no longer sufficient and will certainly not bring Georgia any closer to full NATO membership. This is something of which Russia is very well aware, and the danger of a Russian invasion is indeed lurking around the corner. ■

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# Viewpoint from Zagreb

Photo: Igor Tabak



## Croatia – 10 Years as NATO Member

**Igor Tabak**

In May 2002, Croatia was invited to become part of the NATO Membership Action Plan, and in October that year, it

submitted its first Annual National Programme. At the April 2008 NATO summit in Bucharest, Croatia received a formal invitation to join NATO, and after some final negotiations, the Accession Protocol was signed in July 2008, with the ratification process finally concluded on 1 April 2009 so that Croatia was able to attend the NATO summit in Strasbourg/Kehl as a full member.

However, while the economic benefits for joining NATO were stated among the arguments during the pre-accession period, Croatia felt none of the economic benefits. The full weight of the economic crisis hit the country right around the time of NATO accession – when international economic ratings were slashed, the budget got rebalanced three times in 2009, and, on 1 July that year, the prime minister resigned in spectacular fashion on corruption charges. From almost HRK5.7Bn (around €764.1M), the defence budget was quickly cut to HRK5.05Bn – a reduction of almost €87.2M or about 11.4% in 2009 alone. In fact, the defence budget kept falling until the low point in 2016 at HRK4.02Bn (around €542M). The loss of almost 30% of the available defence funding during this period set the stage for a myriad of problems in the field of defence and made Croatia one of the slowest EU countries to exit the economic crisis. Those budget developments also broke down most of the de-

fence planning developed before the crisis, making the Ministry of Defence (MoD) a passive player on the national political stage. In fact, it took Croatia until 2013 to start getting back its defence bearings with a new Strategic Defence Review approved in July 2013, and a new Long-term development plan for the Croatian Armed Forces (CAF) published in December 2014. During the crisis, all the larger planned modernisation efforts were first temporarily suspended (for example, fighter aircraft, naval modernisation), and then partially supplanted by a systemic reliance on equipment donations by larger NATO member. This proved to be a clear benefit of being a NATO member. Another benefit, although an unexpected one, proved to be the 'shielding' effect that various national NATO commitments (in-country and abroad) provided to the MoD and CAF at a time when faced with proposals for even more severe budget cuts and connected loss of capacities. Therefore, the need to perform well but also to look good in front of NATO allies stymied the tendencies to reduce the national defence budget even further during this period.

Unfortunately, the way that the Croatian authorities approached NATO negotiations – with a severe lack of transparency – had repercussions. The wider public remained to a large degree unaware of the reforms undertaken, as well as the realistic costs and benefits of NATO membership itself. While there was no referendum held in Croatia on the question of NATO accession, with only a notional public campaign informing about the topic, the approval rate for NATO membership conveniently skyrocketed in February 2008 when the first recognitions of Kosovo also caused the Croatian embassy in Belgrade to be burned – awaking public fears of new confrontation with its former wartime enemy Serbia. Even after NATO accession, this kind of regional context continued to drive relations with its neighbours – with the general public having little faith in NATO collective guarantees of security or assistance.

Since 2017, and the corresponding economic recovery, the national defence budget began to rise again. NATO membership gained prominence slowly, with several highly visible international operations forming the backbone of the Croatia-NATO relationship (for example, NATO EFP in Poland and Lithuania, KFOR, and Resolute Support in Afghanistan). All these are places where Croatia is acting in a 'lead country' role, bringing together combined forces of smaller countries from the Western Balkans region to enhance, through co-operation, their otherwise limited national capacities. Along the way, Croatia continues to struggle in coming close to the NATO goal of 2% of GDP for defence, primarily through focus on investment in personnel (education/retention in service) and modernisation.



Photo: Arturo Guzman, US Army

**A Croatian HEDGEHOG Battery at Bemowo Piskie training range, Poland, 12 May 2018. The Croatian Armed Forces are participating in two NATO Enhanced Forward Presence Battle Groups in the Baltic Region.**



# The NATO Military Engineering Centre of Excellence

## Team of Authors

**Military Engineers have always had a tight bond with technology. This fact is easily explained as many national engineers have a civil engineering background, and if not, they receive a military engineering education, which has lots of similarities.**

**T**echnical thinking is in our veins and, when searching for solutions, we have to force ourselves to broaden our views and not immediately find a solution by using technical applications.

This technical focused thinking – call it a slight disablement if you like – also brings us some advantages. Where others turn into despair if plans are blocked, military engineers tend to stay calm and use whatever is available in the physical environment to solve the problem. Examples from history include floating bridges of claimed civil boats by connecting them, the use of explosives to crack iced rivers, inundate areas if enemy troops move too fast, or drain land and protecting moats before attacking.

The most recent technological developments ask for technical counter-thinking and counter measures. I quote the key takeaway from the Chiefs of Transformation discussion: "Future capability development will require developing an innovative mindset and change in culture both within our militaries and in the relationship we have with industry, academia and international organisations. Embracing this diversity and sharing best practices among allies and partners are key to solving our current and future challenges in this arena".

Of course, we can ask ourselves what really changes with regard to military engineering objectives. Mobility will remain important for the movement of our own troops, as it has always been. The bridge might be laid down more quickly and with less manpower, it is still a bridge. The same holds true for counter mobility and general engineering. And base camps might use energy saving techniques and solar panels for power production, but it will remain base camps to host troops in the field if we need them there.

Where we can find advantage, is using technology when it reduces manpower – our most vulnerable and expensive asset. Besides, we can no longer rely on the large quantity of troops we had in conscript ar-



mies. Or by using technology for the measuring and mapping of the physical arena where we create advantages for our own forces, making it hard for enemy troops. Fast and accurate information is key also for military engineers.

The innovative mindset we require is partly in progress when we, for example, look at the developments in route clearance and military search techniques. More will be explained about this in this article. The change in culture to link up with industry and academia is not new for military engineers. We already have them. However, we do hesitate to exchange military and civil personnel and truly share knowledge and best practices. Here, we might really move towards a deep integrated and resilient defence organisation we seek for.

Another challenge is the vast logistical support our units require to perform their tasks. In case we have to fight in dispersed or isolated situations, we cannot rely on a guaranteed military support and so the available civil services might be the only link we have to extend our military sustainability. Therefore, it is better to know our mutual possibilities before a crisis occurs. The technical innovations in the field of

military engineering are already in practice. Not that we are ready for the future. We will never be finished improving and innovating, but we are on the way towards the future and future warfare. This article will provide an update on the development of operational and tactical military engineering doctrine. It is, of course, joint, but also gives guidance for cyber- and special operations support. The article concludes with a view on the interdependency of military engineering and logistics.

## Route Clearance Capabilities

"Mobility" is expressed as one of the fundamental roles of military engineering. One of the common tasks listed in this role is route clearance. Clearing routes and roads from several different type of obstacles, primarily IEDs, both facilitates friendly force movements and reduces possible risks in the area of operation.

The most important distinction between route clearance and conventional mine clearance activities is related to the progress, speed and level of threat. Unlike mine clearance under the condition of no enemy threats and at lower speeds, route clearance is performed at higher speeds and at varying levels of enemy threat to facilitate the movement of friendly forces. It is also different from "Breaching Operations", which generally are conducted under a higher level of enemy threats and with an increased level of speed.

Assessing route clearance solely as part of counter-insurgency operations might not be appropriate due to changing threat environments. Nowadays, as the concept of hybrid warfare is often pronounced, the ability of quick and easy adaptation of explosive systems to impede friendly forces mobility is more likely than in the past. On the other hand, as remotely controllable land and air systems gain popularity, threat direction has recently shifted from X-Y to

the third dimension of battlefield. These recent changes in the operational environment indicate that there is still a need for continued improvement in the development of detection and protective capabilities for route clearance.

The main capabilities currently used for IED identification in route clearance operations are metal and GPR-based. Considering current route clearance capabilities, detection of small/often-concealed threats, tracking

technologies that are expected to improve as next generation capabilities in route clearance.

In addition to doctrine work, MILENG CoE's recently initiated "Web Based RC E-Learning Package" project aims to share knowledge, increase the level of situational awareness and train member states personnel. Within the current and possible threats, route clearance is expected to be a major effective factor for friendly forces

should, therefore, be sufficiently definitive to guide operations and versatile enough to accommodate a wide variety of situations.

MILENG is a function in support of operations to shape the operational environment. To achieve this goal, the MILENG staff is adequately equipped with a broad field of knowledge. MILENG incorporates various areas of expertise such as engineering, explosive ordnance disposal (EOD), environmental protection, military search and management of infrastructure, structure (including contracted civil engineering). MILENG also makes a significant contribution to countering improvised explosive devices (C-IED) by protecting the force; and providing life support.

Therefore, AJP-3.12 is in the review process by the CoE as the main MILENG reference document at the operational level. The above mentioned capabilities are the foundations to develop technical solutions needed to support MILENG functions and roles (for example, engineer construction equipment such as bulldozers, graders, excavators, route clearance systems, mine detection devices, military bridge systems, bridge classification tools and programmes, base-camp construction and maintenance).

## Joint Publication for Tactical Level HQ

Writing doctrine is all about getting the right balance of detail required by the reader. For NATO tactical level doctrine, there are varying levels of detail required depending upon the audience you are writing for. Higher level doctrine will, therefore, contain less detail normally, as we do not want to constrain the HQ and planners with detail they simply do not need. Higher level doctrine is written more to inform HQ staff officers on how to think about a task, whereas lower tactical doctrine requires the level of detail on how to perform a task.

This can be easily demonstrated in looking at a counter-mobility problem. A division HQ requires to know and explain the effect they are looking for a given obstacle zone to a subordinate unit. Lower in the organisation, a battle group and its associated MILENG elements must establish a way of providing that effect through the use of obstacles covered by observation and effective direct and indirect fires. In this example, the divisional HQ would not be as concerned with obstacle placement as they will leave this fine detail to their subordinate unit(s) to sort on the ground.



Graphic/Photos: MILENG CoE

**Route clearance is performed at high speeds and at varying levels of enemy threat.**

low-signature/slow-moving targets, fusion across multiple tracking sources, target discrimination and identification, neutralisation in complex environments, and force protection through stand-off are some of the stated shortfalls by both academics and practitioners.

To overcome these shortfalls, joint initiatives for the development of additional capabilities continue within NATO. Panel and task group activities carried out in NATO Science and Technology Organisation are some examples of this. Over the last three to four years, five different task groups focusing on mounted and dismounted capabilities have been observed to focus directly on route clearance capabilities.

The development of detection technologies, currently used in different fields for identifying IEDs, constitute the main focus of R&D activities within the industry. "Hyperspectral camera", "Short-Middle-Long wave Infrared Sensors", "RF High Power Microwave" and "Multispectral Imaging" are some of the alternative

in the future, as it is today. Considering the evolving technology and changing operation needs, works carried out on all aspects of doctrine, organisation, training, material, leadership, personnel and facilities seems to be continuing with determination as we move forward.

## Allied Doctrine on Military Engineering

For allied and coalition forces to plan, execute and support operations, they need a clear understanding and widely accepted doctrine. As NATO transforms its capabilities to meet the evolving security challenges, the Alliance must adapt its doctrine accordingly.

Allied joint doctrine enhances the interoperability of Alliance forces, and fosters initiative, creativity and conditions that allow commanders to adapt their approaches to varying and evolving circumstances. Doctrine focuses on "how", not "what" to think. Allied joint doctrine

For the ongoing review of Allied Tactical Doctrine for Military Engineering, ATP-3.12.1, this type of balance must be struck throughout the publication, as at the “tactical level” the book is designed primarily for the high tactical level of division. However, as with most things, there will always be exceptions. For instance, whenever an emerging capability or special mission is to be described it may be described in greater detail than actually required for the purpose of spreading knowledge about it or because it only resides in this one location in the doctrine.

The current review of Allied Tactical Doctrine for Military Engineering involves a number of interested countries and NATO HQs, seeing what they require from the publication. The main objective of this revision is streamlining the delivery and explanations of MILENG tasks. However, as with many things, tasks can fall in more than one of the traditional MILENG roles. The writing of a high tactical publication definitely has its issues that need to be tackled along the way. The MILENG CoE, as custodian of this publication, is fortunate to have a core group of countries, HQs and other CoEs that are assisting the process.

## Military Search Developments

For most people in the army, military search is about personnel being equipped with mine detectors trying to detect improvised explosive ordnance in Afghanistan or Iraq. This is a symptom of how military search has become linked to ‘out of area’ operations and, specifically, to countering improvised explosive devices.

To describe the wider military search contribution and its role to future operations, we need to look at possible future conflicts. In future operations, it is likely that NATO will face a combination of state and non-state actors, thus constituting a sort of ‘hybrid-threat’. Some of these actors will likely also act in an asymmetric manner to negate the advantages of the alliance. An adversary choosing this approach may be difficult to identify and its resources may be hidden. Future conflicts will increasingly take place in urban areas. This includes super-surface and sub-surface areas. Sub-surface operations will also increase as the adversary will use these areas to avoid detection and targeting.

The combination of the asymmetric threat with a more complex operating environment will make it increasingly difficult to identify and target non-conventional adversaries. The military search contribution to these challenges is best described using

the two objectives of search: defensive and offensive search. The objectives are linked to the purpose of the search, not whether or not the search activity is linked to offensive or defensive operations.

Defensive search is reactive in nature and covers force protection, protection of pre-planned events and protection of critical infrastructure. This aspect of military search seems quite well understood in most staffs and headquarters, as this has been the main employment of military search in operations. This relates especially to the “Defeat the Device” pillar of the C-IED approach.

Another aspect is how military search can contribute to mobility and force protection in urban and sub-surface environments. These environments include inherent threats and threats placed by an adversary. Military search has developed tactics, techniques and procedures for operating in these environments. These enable military search units to provide intimate support to units operating in these environments.

The objectives of defensive search will still be valid in future conflicts as there is still a likelihood of asymmetric threats being present in rear areas. Defensive search activities will assist to mitigate these threats. Offensive search is characterised as being used to seize the initiative in order to deny resources and opportunity or to secure material for exploitation. The gathering of material is used to feed the intelligence cycle and for exploitation and can be seen as especially relevant in scenarios where an adversary is hidden. The material gathered may help identify the adversary, which could feed in to the targeting process. Furthermore, the denial of resources could deny the adversary the means to mount actions. Offensive search may be less well understood than defensive search as military search is widely associated with the latter as the objective.

The continuing development of the military search capability will only enhance its contribution. Also, an increased understanding of the offensive aspects of military search will lead to better intelligence and potentially targeting.

## Military Engineering and Logistics

Among the roles of Military Engineering (MILENG) in NATO, general support is maybe the one involving the most different and numerous skills and expertise - from infrastructure management and construction to support to logistics (including water and power production) as well as environmental protection considerations. As stated in NATO MILENG Policy, and

with regard to general support, the action of military engineers is delivered in the following (although not limited to) areas.

Advice to the commander for infrastructure management and construction is a wide subject, requiring a high-level of education as a civilian engineer. However, it has to be transferred to the demanding military aspects of an operation. Infrastructure assessments in theatre of operations include vertical and horizontal infrastructure needed for a specific mission (road, rail networks, airports, seaports, buildings provided by a host country or are to be built, platforms and camp design) are some of the missions military engineers will have to perform to support the mission. MILENG must also have the capacity to harden or restore existing infrastructure as well as building brand new camps. The MILENG advisor will, therefore, also have to deal with the financial aspects of infrastructure, by contracting with civilian companies when needed or dealing, for example, with real estate and private property. This mindset is what the MILENG CoE is trying to emphasise.

Utilities (water and power production) is one of the key aspects in providing life support to the units on the ground. It contributes significantly to the sustainment of a deployed force. In that field, support to logistics is essential: supply roads maintenance, logistics platforms with storage effective and enduring capacities will enhance sustainability. MILENG is also always on the edge when it comes to implementing new technologies, such as bridge assessment software, UAVs for Engineer reconnaissance, or energy efficient equipment and procedures to reduce the energy demand while keeping the optimum military effectiveness. If the planning conducted by MILENG officers is important, the key for success is the actual work performed by MILENG NCOs and soldiers, using specific and sometimes high-tech equipment, where long and demanding training is necessary (for example, water purification units, heavy work equipment like bulldozers, levellers), not forgetting other professional bodies like masons, carpenters, electricians, bringing their essential skills while still remaining real fighters. Military engineers make it happen and the MILENG CoE is happy to develop knowledge to support this mindset. In addition, Environmental protection is a MILENG area of expertise which importance grew significantly over the past years, maintaining military engineering in line with current environmental concerns. ■



# “The technical revolution has changed the nature of conflicts.”



Photo: Fter

**The Brazilian Armed Forces are in the midst of several major modernisation programmes. ESD had the opportunity to speak with General Edson Leal Pujol, Commander of the Brazilian Army.**

**ESD:** The Army's vehicle fleet is receiving significant resources for the modernisation of MBTs, the production of GUARANIs, the upgrade of all M113 variants, for 4x4 vehicles from IVECO, and so much more. What is the status of these programmes?

**General Pujol:** The Strategic Army Programme GUARANI aims at the mechanisation of the land forces, the transformation of the motorised infantry into a mechanised infantry and the modernisation of the mechanised cavalry. It is a strategic initiative based on research and development carried out by the Ministry of Science and Technology and the Brazilian Defence Industry. In this sense, equipment and materials used on the platform for military operations are produced domestically, with more than 60% local content. This programme provides quality and technological progress through high-level technology transfer and qualification of personnel, which contributes to income and jobs. Currently, the programme has already delivered about 10% of the expected fleet.

The programme has been conceived in a way to be integrated with the other Army Strategic Programmes, particularly with the SISFRON, PROTEGER and anti-aircraft defence, besides enhancing integration with the other forces.

The first product to be engineered and delivered is the GUARANI 6x6 armoured transport vehicle to replace the URUTU vehicles manufactured by ENGESA, which have been used by the Brazilian Army for more than 40 years. The programme also provides for the

purchase of other versions of the 6x6 vehicles. The EE GUARANI programme also aims at the procurement of armoured 4x4 vehicles, incorporating modern weapon systems (with selective lethal capacity) and a flexible control and command system allowing their use in various conflict scenarios. The acquisition of these vehicles is the responsibility of the Manufacturing Directory and the contract for the purchase of a pilot batch will be signed later this year.

When it comes to modernising the other armoured vehicles, there are two more ongoing projects – one related to the VBC LEOPARD 1A5BR MBT and another to the VBTP M113 troop transporter. The first project is in its preliminary phase at the Army Doctrine Centre. The VBTP M113 is being investigated at the Maintenance Regional Park 5 (Curitiba/PR) and there are plans to upgrade the vehicle to the A2MK1 standard; 150 vehicles related to the first contract have already been modernised. Currently, a second contract is in place aiming to upgrade another 236 vehicles until the end of this year. Hence, only 196 armoured vehicles will be left awaiting a future modernisation.

**ESD:** The Brazilian Army has significant firepower that might even be considered of-

fensive. Do you consider the Army to be an offensive or defensive force, and what are its main challenges?

**General Pujol:** The strongest branch of the Brazilian army is the Land Force (FTer), which is structured into "Grandes Comandos" and "Grandes Unidades". With a different firepower in their operational levels. The Fter is prepared and trained to be used in Brazilian defence as an offensive or defensive force. Since 2010, the Brazilian Army has been in a process of transformation in order to better fulfil its main task, which derives from our constitution – the defence of the country – bearing in mind the size and international weight of the country. The main challenges in achieving these goals are to increase the resources allocated to Fter modernisation in order to bring it into a better condition, as provided for in the National Defence Strategy, to increase budgetary stability and to address the technological challenges that will come with the new equipment and weapons that the Fter will have at its disposal after transformation.

**ESD:** When it comes to Army Aviation, while there are a number of programmes currently running or envisaged (BLACKHAWKS, HM-4s, SUPER PANTERAS, and so forth): is the

Photo: Andre Gustavo Stumpf Filho



**The VBTP-MR GUARANI is a 6x6 armoured personnel carrier developed by IVECO and the Brazilian Army to replace all URUTU by 2015 as part of the URUTU-III modernisation programme.**

Army able to bring enough force to bear quickly? Is there a sufficient strategic transport capacity?

**General Pujol:** In any operational environment the deployment of necessary force does not depend exclusively on the Army Aviation; it is a much broader concept that rests on a joint effort of Navy, Air Force and Army.

The National Defence Strategy states that the Army will utilise flexibility and elasticity to fulfil its constitutional duty. In response to your question, we will focus on flexibility – “the ability to deploy military forces with a minimum of fixing in advance and maximum adaptability to the circumstances of the deployment. In peacetime, this stands for the versatility of substituting presence (or even omnipresence) by the capability to become present (mobility) wherever required according to the information available (observation/control).”

When it comes to the long-range transport of large troops, which is a characteristic of strategic transport, it will always be necessary to have large aircraft, preferably fixed-wing aircraft, which are typically deployed by our Air Force. On the other hand, transporting smaller formations of troops to engage in tactical operations in the field will require smaller means of transport which are more flexible and more mobile. This is why we have Army Aviation, because it allows local commanders to “decisively explore an opportunity to quickly intervene in the manoeuvre and concentrate or disseminate the combat force, thereby significantly impacting the campaign.” This has dynamised the concept of the “nonlinear battlefield”.

The high mobility of Army Aviation, combined with the versatility of its means and the lethality of its weapon systems, allows operations to be conducted for the purpose of external defence and for domestic and territorial defence.

Today, Army Aviation can be used to provide the ground force with the air mobility and flexibility it is expected to provide in a tactical context. The Army Aviation Strategic Programme was introduced to adapt Army Aviation to the current and future requirements of Brazilian society as defined by END. With investments, the programme (among other objectives) aims to expand the infrastructure of Army Aviation, modernise its training and employment capacities, provide the Army with medium-sized aircraft to replace the existing and obsolete manoeuvre aircraft and increase the capability for immediate strategic response, command and control and logistical support, especially in the border region.

**ESD:** What do you think about the use of the Army to protect public safety, as happened in Rio de Janeiro in 2018, consider-



Photo: Centro de Instrução de Blindados

**The Brazilian Army plans to upgrade its VBTP M113 to the A2MK1 standard.**

ing the limits guaranteed imposed by the “Guarantee of Law and Order” (GLO)?

**General Pujol:** The development of the global operational environment has gradually changed the balance of power between states. As a result, we have instabilities and uncertainties that fuel local and regional conflicts with roots dating back into the past, as well as the emergence of new actors, including non-state actors.

The technological revolution that the world has experienced has also changed the nature of conflicts and the way politics is conducted. States are therefore exposed to new threats. Technological change has transformed “conflicts of the industrial age” into “conflicts of the knowledge age”.

In this sense, military operations in environments regulated by GLO require a command and control structure (C<sup>2</sup>) that is fast and mobile, as well as the ability to enhance participants’ situational awareness and interoperability in these conflicts.

Under the Strategic Programme for the Protection of Armed Forces Society (PROTEGER), we are developing the prototype of a Mobile Operations Coordination Centre (CCOp Mv) in cooperation with Brasília University (UNB). This modern command and control system (SisC<sup>2</sup>) will be equipped with state-of-the-art communication technology and electronic devices that will enable transmission of voice, data and images to other command centres (CC<sup>2</sup>), including the MoD. In addition, its software architecture will enable integration and interoperability with other actors, improving its capacity and performance.

The CCOp Mv will consist of an Operation Coordination Team and Access Knots (NA). The first module will control the communication, conduct meetings and enable some secrecy of information. The second module will have the ability to be deployed in the operating theatre and to stabilise a communication network that will ensure the information flow required to complete the mission. With regard to the deployment of the Army in Rio de Janeiro in 2018, which has been characterised by a wide range

of operations and the need to establish C<sup>2</sup> with agencies and governmental and non-governmental organisations operating in the area, CCOp Mv will allow co-operation and coordination with these units’ activities in support of a “Grande Comando Operacional” (DE and/or Superior). In this way, the modular and mobile structure made it possible to set up C<sup>2</sup> in the shortest possible time and in areas without local communication resources.

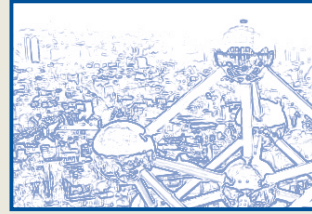
The Brazilian Army’s mission can be found in Article 142 of our Federal Constitution, which states that the Armed Forces must contribute to the guarantee of national sovereignty, constitutional rights and law and order (GLO), the protection of national interests playing a part in national development and social prosperity. Hence, law and order measures belong to the duties of the Terrestrial Force. According to the doctrine, these operations are enlisted among Basic Operations/Operations of Coordination and Cooperation with Agencies. Nevertheless, it is common sense that the employment of the Army in this kind of operations as the GLO in Rio, conducted in the context of the Hurricane Operation, presuppose an exceptional situation and have to be conform to legal marks that define the limits of force employment.

**ESD:** In an ideal situation, what would you most like to be able to add to the Army’s resources?

**General Pujol:** In an ideal situation, the Army General Needs (NGE) would be fully satisfied and the government would approve the budget proposal. The Land Forces are aware that the best result would be to implement the following strategic priorities as defined in the Strategic Plan of the Brazilian Armee (PEEx): the re-equipping and restructuring the field artillery, re-equipping and restructuring the anti-aircraft artillery, mechanising the Land Forces and restructuring the armoured forces.

**The interview was conducted by Roberto Carvalho.**





## NATO in Afghanistan: A Situation Report on Resolute Support

Joris Verbeurgt

In the interim-review report of Operation Resolute Support, which was published in the April 2018 issue of ESD, we concluded that “The conflict in Afghanistan extends beyond the Afghan borders and, therefore, a sustainable solution can only come from diplomacy and bargaining between all stakeholders. Resolute Support, initially designed as a step towards an honourable exit, is just another phase in a conflict that seems to have no ending.” More than a year has

Force (ISAF) which had been stationed in Afghanistan since 2001 following the attacks on the United States on 11 September 2001. As a non-combat mission, Resolute Support provides training, advice and assistance to the Afghan National Defence and Security Forces (ANDSF), which assumes full security responsibility over Afghan territory and airspace. The Resolute Support Mission works closely with different elements of the Afghan Army, Police and Air Force and

comprises around 17,000 personnel from 39 NATO Allies and partner countries, or 4,000 personnel more than in April 2018. The Mission operates from one ‘hub’ situated in Kabul and on Bagram Airfield and four ‘spokes’: Mazar-e-Sharif in the north of the country, Herat in the west, Kandahar in the south, and Laghman in the east. There are nine commands in total: a Combined Transition Security Command for the whole of the territory and airspace, five Train, Advise and Assist Commands (one for Kabul province and four for

stan and its citizens in a sustainable manner. Operational planning, budgetary development, force generation processes, management and development of personnel, logistical sustainment and civilian oversight are the areas in which the men and women of Resolute Support are active. In each area, they also take care of ensuring that the Afghan security forces and institutions act in accordance with the rule of law and good governance principles. In July 2018, at the Brussels NATO summit, Allies and partner countries agreed to extend the international community’s support to the long-term financial sustainability of the Afghan security forces until the end of 2024 through the Afghan National Army (ANA) Trust Fund, one of three funding streams used by the International Community to channel its financial support to Afghanistan’s security forces and institutions.

The current commander of the Mission (and of US forces in Afghanistan) is General Austin S. Miller. The Senior Civilian Representative, who carries forward the Alliance’s political-military objectives in Afghanistan and represents the political leadership of the Alliance in Kabul officially and publicly, is Ambassador Sir Nicholas Kay from the UK. He liaises with the Government, civil society, representatives of the international community and neighbouring countries.

### Training, Advising and Assisting the ANDSF

What does Resolute Support accomplish on the terrain? It would take us too far here to sum up all the initiatives, which were taken within the framework of the mission in the fields of training, advice and assistance to the ANDSF. However, some examples from the period April 2018 to April 2019 may serve as an illustration.



**A BLACK HAWK helicopter of the US Army Combat Aviation Brigade, 1st Armored Division, navigating through diverse terrain in Afghanistan in March 2019**

Photo: US Army

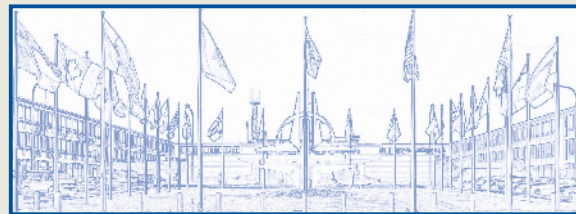
passed since that somewhat sceptical conclusion was published. So, what has happened in Afghanistan since early 2018? Are there any changes or hopeful signs? And in what sense does Resolute Support contribute to a sustainable peace in Afghanistan?

### The Mission

The NATO-led Resolute Support Mission was launched on 1 January 2015 as follow-up to the International Security Assistance

Force (ISAF) which had been stationed in Afghanistan since 2001 following the attacks on the United States on 11 September 2001. As a non-combat mission, Resolute Support provides training, advice and assistance to the Afghan National Defence and Security Forces (ANDSF), which assumes full security responsibility over Afghan territory and airspace. The Resolute Support Mission works closely with different elements of the Afghan Army, Police and Air Force and





Training throughout 2018 and the first quarter of 2019 was mainly focused on the Afghan police, Special Operations Forces and airpower. Training ranged from basic warrior training to staff courses for operational planners and from firing the M203 grenade launcher to a specialised mountain warfare course. Special attention is given to the integration of women officers in the rank and file of the Afghan forces. Take, for example, the Afghan Special Mission Wing, employing a fleet of Mi-17 helicopters and PC-12 fixed wing aircraft to conduct a full-range of special operations aviation mission tasks. The personnel numbers are increasing towards 60, and additional women soldiers are being recruited to serve in different sections of the SMW, such as medical, operations, intelligence, logistics and security. Another example is the Cobra Strike Manoeuvre Course (CSMC), Afghanistan's premier training venue mentored by NATO, which took place near Kabul in September 2018. CSMC is responsible for developing the superior fighting skills of the Commando Special Operations Kandaks (SOKs) from a mounted platform, known as a Mobile Strike Force Vehicle (MSFV) and honing their unmounted patrols, search and urban warfare expertise. The provision of advice also takes place in numerous fields: In April 2018, senior Afghan officials met with New York City Police Commissioner James P. O'Neill to discuss the state of policing in the country and exchange ideas and best practices. In Sangin (Helmand province), US Marines advised the ANA 2nd Brigade on new or updated administrative and logistical procedures to maintain and sustain equipment and personnel deployed to the frontlines in Helmand and Nimroz provinces. In combat situations, on 29 August 2018, commandos from the Afghan 7th Special Operations Kandak, advised by US Special Operations Forces, raided Taliban compounds in Sangin district (Helmand province) and seized large amounts of weapons and bomb making materials. One week later, Afghan Special Security Forces (ASSF), advised by US Special Operations Forces, conducted a helicopter raid on Taliban compounds in Maywand district (Kandahar province). Assistance is predominantly given by the US Airforce and US Special Operations. In early

April 2018, US Forces and ANDSF conducted strikes on 11 Taliban narcotics production facilities in Farah and Nimroz provinces. In the Northern Jowzjan province, Afghan Special Security Forces, advised by US SOF, eliminated 22 IS fighters attempting to defend the strategic centre of Darzab district. Six days earlier, the IS emir for northern Afghanistan was killed by a US airstrike. Persistent military pressure in Jowzjan province, applied by Afghan and US Special Operations Forces (SOF), have reduced IS to an isolated group of fighters devoid of leadership. Besides offering assistance with airstrikes and special operations, Resolute Support also assists the Afghan government in strengthening democracy and institutions. For example, the parliamentary elections, which took place on 20 October 2018, were prepared in an exercise called 'Strong Shield'. To promote peace and reconciliation in western Afghanistan, the First Interregional Shura, including local authorities, religious leaders, and elders from five provinces, as well as leadership from the Train, Advise and Assist Command-West, assembled to discuss peace and reconciliation efforts.

## Resolute Support and the Afghan Peace Process

How does Resolute Support contribute to the Afghan Peace Process? Does it fit into President Trump's strategy to stabilise the country and quell the Taliban insurgency by focusing on defending population centres while ceding much of the remote countryside to the insurgents? Does Resolute Support help the interdiction campaign against the Taliban, with airstrikes on their narcotics laboratories and other revenue

sources? The examples given above show that Resolute Support is committed to the overall US strategy of pressuring the Taliban to the negotiating table. Intense fighting is still going on all over the country and the Taliban now control



**A Resolute Support logistical officer discusses building plans to improve living conditions in Parwan prison with the Afghan army officer in charge of the Parwan Detention Facility, 10 January 2018, on Bagram Airfield, Afghanistan.**

and influence more territory than at any point since 2001. The violence is far from under control and civilian casualty rates are peaking. Official talks between the Taliban and the Afghan government continue to be illusory: the Taliban see the Afghan government as puppets and the Loya Jirga, the traditional gathering of more than 3,000 elders, religious scholars and prominent Afghans to discuss peace in Afghanistan, and the next steps in the search for direct talks with the Taliban – failed because of internal disputes. However, there is also some good news. In 2018, for the first time since 2001, the Taliban agreed to a three-day cease-fire during the important Muslim religious holiday of Eid al-Fitr. Although much needs to be done before a genuine intra-Afghan dialogue can take off, direct US-Taliban talks, taking place in Qatar's capital Doha right now, might have a chance of succeeding. Resolute Support can help support and facilitate these discussions.

# Blue Homeland: Turkey's Naval Exercise

**Andreea Stoian Karadeli**

Launched on 27 February, Blue Homeland 2019 was Turkey's largest naval exercise in the country's history, testing its ability to wage war simultaneously in the Black Sea, Aegean Sea and Eastern Mediterranean. The exercise was designed to build confidence and stability throughout Turkey and to contribute to NATO's common objectives and should therefore be analysed in a wider context.

The Turkish naval exercise "Mavi Vatan", translated "Blue Homeland", took place from 27 February to 8 March and was an important show of force on 462,000 square kilometres in the Black Sea, the Aegean and the Eastern Mediterranean, with 103 military ships and 20,000 soldiers participating. As part of the exercise, the Turkish Navy visited 33 ports in Turkey and another seven abroad in the Black Sea to demonstrate Turkish interest in military cooperation in the region. The exercise had been planned six months in advance according to NATO rules and regulations and was conducted in accordance with international law.

According to Turkish officials, Blue Homeland 2019 was a joint military exercise to test the weapons and military systems of the Turkish naval forces, to increase the level of preparation and to develop interoperability procedures with other military commands. The exercise provided an opportunity to present the new weapons and systems recently added to the Turkish military inventory and manufactured by the domestic defence industry.

As an impressive show of force, which sent a powerful message both internally and externally, a large number of national and international military ships took part in Blue Homeland: 13 frigates, 6 corvettes, 16 assault boats, 7 submarines, 7 mine hunting ships, 17 auxiliary class ships,

14 outpost ships, 22 landing ships and a training ship. The new systems and weapons were tested in various operations, including naval control, submarine defence warfare, mine warfare, electronic war-

fare in a combat-proven fashion, is a breakthrough and a force multiplier in joint operations. The ANKA-S system is developed for day and night reconnaissance, surveillance, fixed/mobile target detec-

Photo: Turkish MoD



**Turkish corvettes during Blue Homeland 2019**

fare, preparatory training, joint training with the Air Force Command, the Turkish Land Weapons Command, and training of all-purpose helicopters by the associated coastal units.

## Turkish Defence Industry Results

An important element of the exercise was the use of new military systems and equipment developed by the Turkish defence industry. The Navy used ANKA and BAYRAKTAR Unmanned Aerial Vehicles in marine operations. The incorporation of unmanned systems into the Turkish military's operational concept, especially

tion, detection, identification, tracking and real-time image intelligence tasks also under adverse weather conditions. ANKA-S has a payload of 200 kg and an altitude of 30,000 feet and is capable of 24 hours of flight time.

In addition, the coordinated operation of the Turkish Land Weapons Command provided an opportunity to test the developments of the UMTAS and CIRIT weapon systems.

According to the descriptions of the Turkish MoD, UMTAS is a long-range anti-tank missile system that can be integrated into various platforms such as helicopters, UAVs, light armoured vehicles, fixed ground platforms, short-range aircraft and

## Author

**Andreea Stoian Karadeli** is freelance researcher based in Turkey and a PhD Candidate at Mihai Viteazul National Intelligence Academy in Romania. Her interdisciplinary research varies from cultural and intercultural studies to conflict resolution and focuses on national security and terrorism, with expertise in the Middle East.



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- Payloads up to 2,155 kilograms, including 360° maritime radar
- Demonstrated sonobuoy monitoring and control capability
- From a family of UAS with more than 5 million flight hours

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**Leading The Situational Awareness Revolution**



Photo: SSB



**During the military exercise Blue Homeland 2019, Turkey tested domestically developed and produced systems.**

naval platforms and is effective against all armoured systems. UMTAS is designed as an anti-tank missile system for the National ATAK Helicopter (T-129). The system developed by ROKETSAN enables day and night operation in all weather conditions. With a range of 8 km, UMTAS was developed against armoured targets and can be used either air-to-surface or surface-to-surface using either the infrared seeker and laser seeker options. With both fire-forget and fire-update capability, UMTAS provides the ability to shoot beyond cover, achieve precise hits and effectively evaluate impact, and it is effective against both stationary and mobile targets, with the benefit of target update.

CIRIT is a cost-effective solution against light armoured/non-armoured fixed/mobile targets that can be integrated into various platforms such as helicopters, UAVs, land vehicles, stationary platforms, light attack aircraft and naval platforms; it is designed to close the gap between low-cost/low-precision unguided missiles

and expensive anti-tank missiles. Compared to the classic 2.75" laser-guided missiles, CIRIT, with a range of 8 km, has the longest fuselage in its class thanks to its aerodynamic structure and the composite solid fuel engine. Two alternative warheads with high explosive capacity can be attached to the CIRIT missile, which is capable of destroying mobile and light armoured/unarmoured targets. While the multi-purpose warhead has armour-piercing, burning and anti-personnel effects, the second one has only a fragmentation effect. Series production of the CIRIT rocket began in 2010 and has met great interest in foreign markets.

During "Blue Homeland", air defence warfare, underwater warfare, submarine warfare, land bombardment, control and direction of air elements, and extraction planning and execution were carried out by using the Ship Integrated Combat Management System (GENESIS) developed by HAVELSAN in cooperation with the Turkish Naval Forces Command.

The Turkish naval corvette TCG BURGAZADA, which was produced within the framework of the Turkish MILGEM project ("Milli Gemi" – "National Ship"), fulfilled its first major task during Blue Homeland. As part of an operation, TCG BURGAZADA carried out warning and destruction shots with ASELSAN weapon systems on a boat identified as a potential threat. In another phase of the manoeuvre, TCG BURGAZADA participated together with the Turkish minesweeper AKCAY in an exercise with the Russian patrol vessel VASILY BYKOV and the sea trawler VALENTIN PIKUL near the port of Novorossiysk. Once again, the exercise was a symbol of Turkish-Russian cooperation in recent years.

During another important part of the exercise, military planners deployed Turkey's battle-hardened amphibious units to active conflict zones to keep them at high combat-readiness; the Navy's special operations teams (SAS and SAT commandos) fought hard in Operation Euphrates Shield and Operation Olive Branch. Open-source pieces of evidence suggest that detachments from the Amphibious Marine Brigade's battalions also took part in the cross-border efforts in Syria.

The Navy's manoeuvre and the use of new national military systems and equipment reflect Turkey's awareness of the benefits and responsibilities arising from its maritime territory and the ability of a strong Navy to enhance military, political and economic success. Unlike other traditional branches of the armed forces, navies are truly effective diplomatic means that can benefit Turkey, especially in the current regional context. In this sense, one of the most impressive messages of Blue Homeland is Turkey's commitment to using its maritime options more actively in the coming years to achieve its political, economic and military goals and, above all, increase its status in the region.

In view of this, the main elements of the Blue Homeland manoeuvre should be considered in a regional and international context, which analyses the codename of the exercise and its geographical scope, including its economic and political implications.

## Not just the Land

The code name of the exercise – "Mavi Vatan" / Blue Homeland – symbolises the future political and military agenda of Turkey in the region. Given the strong emotional meaning of the word "homeland" for the Turkish population, Blue Homeland is intended to remind Turks that their national sovereignty is not limited to the

Photo: Turkish MoD



**Turkish supply ships and oilers in support of Blue Homeland.**

land. Therefore, the very code name is a Turkish declaration that assigns the same importance to ensuring the security of their territorial seas as to the protection of the country and suggests that the Navy is important in protecting national maritime interests and the exclusive economic zone.

## The Significance of the Exercise

"Blue Homeland" is a good opportunity for the international community, and regional actors in particular, to assess the improved capabilities of the Turkish Navy and its joint operational capability with other branches. However, the importance of the exercise goes far beyond the military dimension, as Turkey is investing heavily in its naval capabilities, not only to defend territorial waters but also to protect the country's sea lines of communication (SLOC) and to build power projection capabilities.

Analysts see the Turkish naval exercise as a sign of Ankara's determination to protect its territorial and gas exploration rights in the Mediterranean and as a sign of the Navy's recovery from the failed coup d'état in 2016, as well as reflecting three important dimensions of Turkey's strategy in the region: to pursue national interests in an expanded zone of influence, to play a more active role in competition for geopolitical energy markets including naval diplomacy, and to continue developing the domestic defence industry.

Although the military aspect of the exercise is the most important, the economic dimensions are also relevant. Gas fields were first discovered in the waters off Cyprus in 2011, and the Greek Cypriot government has recently signed drilling contracts with big oil companies in the Eastern Mediterranean. If developed, the undersea reservoirs could fundamentally change energy geopolitics and reduce Europe's dependence on Russia for gas. Turkey's position in this regard is stronger than ever, as the Turkish Foreign Minister, Mevlüt Çavuşoğlu, has stated that nothing can be done in the Mediterranean without Turkey. For this reason, Turkey wants a share of the revenues and will use maritime power as an important element in future negotiations.

The Blue Homeland exercise is a reflection of the words of Çavuşoğlu and a strong message that Turkey will not remain passive in matters contrary to its national interests. For these reasons, it can be said that this major naval exercise has military, political and economic reasons.

## The Big Picture

One day after the end of the Turkish naval manoeuvre, the Egyptian Minister of Defence, Lieutenant General Mohamed Zaki, met his Greek counterpart, Evangelos Apostolakis. The two ministers discussed recent regional developments and their impact on stability and security in the Middle East region, as well as ways to improve military cooperation between the armed forces of both countries. Zaki praised the coordination and consultation between Egypt and Greece on military and security issues. The Greek Minister stressed his country's desire to strengthen bilateral cooperation between the two countries in the coming years.

Training "Medusa 8" was launched to promote military cooperation with fraternal and friendly countries with the participation of the Egyptian and Greek Naval and Air Forces and the Egyptian and Greek and Cypriot Special Forces. According to official statements, the training is characterised by the growing military partnership between the Egyptian armed forces and fraternal and friendly countries. It demonstrates the great fighting strength of the participating forces and the high level of training that contributes to meeting the growing challenges in the Mediterranean region.

In view of these developments, which occurred after the Turkish naval exercise, Egypt, Greece, Cyprus and Israel, all supported by the US, are not ready to coop-

Photo: Turkish MoD



**The Turkish Navy shows off its ships at the beginning of the Blue Homeland exercise.**

At the end of March 2019, the sixth trilateral Cyprus-Greece-Israel Summit was held in Jerusalem with the aim of further developing cooperation on energy sources and security in the Eastern Mediterranean; the US Department of State also participated in the conference. The Summit was attended by Greek Prime Minister Alexis Tsipras, Cypriot President Nicos Anastasiades, Israeli Prime Minister Benjamin Netanyahu and US Secretary of State Mike Pompeo, and Deputy Secretary for Energy Francis R. Fannon. The agenda included developments in the Eastern Mediterranean and cooperation in the fields of energy, security and defence, the economy and migration. One month after the Blue Homeland exercise, the Egyptian-Greek Joint Maritime

operate with Turkey in the Mediterranean. This is completely contrary to Turkey's position, as reflected by the words of Çavuşoğlu: No deal without Turkey.

## Conclusion

Turkey has redefined its position on the regional and international stage, and the Blue Homeland exercise has reflected both Turkey's commitment and its success to date. However, the regional context is becoming more complex every day as attempts are made to isolate Turkey from any regional agreement in the Mediterranean. Time will tell what Turkey's next step in this regard will be and how motivated it is to use its vast arsenal in a new diplomatic game. ■

# “The security landscape is rapidly changing.”



Photo: Jakob Østheim/ FMS

## Interview with Rear Admiral Nils Andreas Stensønes, Chief of the Royal Norwegian Navy

In October and November last year, Norway hosted Trident Juncture 18. More than 50,000 participants, 150 aircraft, 60 naval vessels and up to 10,000 vehicles from 30 nations came to Norway for the biggest NATO exercise held in Norway since the Cold War. The exercise has also been a NATO show of force in the Northern region, where the military situation is rapidly changing.

Since World War II, the Royal Norwegian Navy has been a key player in the North Atlantic and the Barents Sea. Rear Admiral Nils Andreas Stensønes and his staff are working hands-on to develop and prepare the Norwegian Navy for what appears to be an uncertain and complex future in the Navy's main area of operations, an area not only crucial to Norway but to all of Northern Europe.

**ESD:** Apart from the accident of the FRIDTJOF NANSEN class frigate HELGE INGSTAD, what is your assessment of the past year for the Royal Norwegian Navy (RNoN)?

**Admiral Stensønes:** The Royal Norwegian Navy (RNoN) assesses that the security landscape is rapidly changing. This landscape is characterised by high-readiness forces, more modern submarines, long-range precision weapons and the use of hybrid means, which create more instability, complexity and uncertainty. This has led to an increased operational tempo for the RNoN fleet and growing demand for naval presence and security in our region. The Coast Guard (CG) is an integral part of the RNoN. Not only security threats, but also environmental changes affect fishing and maritime transportation routes in the High North, leading to increased need for law enforcement assets. Both the Fleet and CG have therefore seen an increase in budgets, shorter reaction time and increased operational time both domestically and abroad. A more competitive security environment may have regional influence; therefore defending Norway and Norwegian interests starts with operations abroad, primarily with our fleet. Taking part in NATO's standing maritime groups and operations

Photo: Torbjørn Kjosvold/ FMS



**A SKJOLD class SES Corvette/Fast Patrol Boat in Northern Norway. The SES technology offers superior mobility capabilities combined with excellent sea keeping capabilities.**

abroad with close allies is the normal situation, and the RNoN has contributed both in the SNMG 1 and SNMCMG 1 during 2018. As of today, the RNoN have currently 151 personnel deployed in the following out-of-area missions; the KNM MAUD (Pacific Ocean, en route to Norway), the

STATSRAAD LEHMKUHL (Naval Academy at sea en route to Norfolk), and the Coastal Rangers Commando (Afghanistan). Domestically, Norway's position in the High North offers extensive room to exercise and allows military units to train effectively in challenging conditions. Exercising



regularly with allies in and around Norway is also the normal situation. In the autumn of 2018, Norway hosted NATO's high-visibility exercise Trident Juncture, where the Alliance successfully trained its core task: collective defence. Trident Juncture was the main focus during 2018, and all available naval assets were used. During the exercise, Russian activity in the area of operation increased as expected. Dedicated assets for dealing with this activity formed part of our national exercise plan. Our assessment is that both the exercise and the way the Russian activity was handled were successes.

**ESD:** From the perspective of the Navy: What was the reason for the above HNoMS HELGE INGSTAD accident? Have lessons been learned? Will HNoMS HELGE INGSTAD be replaced, cannibalised or repaired?

**Admiral Stensønes:** The results of the ongoing investigation performed by the police, the accident investigation board and our own internal investigation group will conclude the cause of the accident. Identified deviation from our current rules and practices will be implemented as necessary. Currently, no decision has been made regarding the future of HNoMS HELGE INGSTAD. Firstly, the vessel has to be safely lifted and transported to Haakonsvern Naval Base. Secondly, the vessel will be investigated further before a final decision about her future will be made.

**ESD:** With the SKJOLD, OKSOY and ALTA classes, the Norwegian Navy operates three different types of Surface Effect Ships (SES). What are your experiences and lessons learned from the use of SES in MCM and FAC applications?

**Admiral Stensønes:** In general, RNoN is satisfied with the application of the SES concept for the SKJOLD (FPB) and OKSOY/ALTA (MCM) vessels. The selection of the GRP sandwich SES concept has proven successful within several major design features. For the FPBs, the superior mobility capabilities, combined with excellent sea keeping capabilities, have together provided the RNoN with a workhorse along our long and rugged coastline. The SES concept has also provided ample topside and deck area for sensors and weapon systems. On the negative side, as for all SES concepts, the weight margin is tight. This is especially challenging over the lifetime of the vessels, when updates and upgrades inevitably are implemented.

For the MCM vessels we have experienced excellent capabilities since the class was FOC in 1994. The Norwegian MCM ves-

sels are amongst the very best within the NATO Alliance. Their combination of mobility and reduced underwater signature has provided the RNoN with an important capability in the maritime domain. Mine sweeping and mine hunting are important to control our waters. The mine threat is clear and present and will challenge our ability to maintain sea control.

Our Navy is presently developing a promising autonomous MCM capability. The system will not be unmanned, rather take most of our operators out of the assumed mined area. The concept is maturing and brings new technology into the theatre with enhanced capabilities. One of our challenges is to avoid capability gaps between the existing and the new MCM concept. Furthermore, we have to maintain mobility also for the autonomous MCM concept.

In total we are very pleased with both classes of SES vessels. We have experienced strengths and weaknesses and have managed to exploit the strengths and suppress the weaknesses to meet the warfighters' needs in all operations.



Photo: NCA/Forsvarets FMIS

**The Norwegian Frigate HNoMS HELGE INGSTAD sank following a collision with the tanker SOLA TS on the morning of 8 November 2018. In late February and early March, the frigate was raised and transported to Haakonsvern Naval Base.**

**ESD:** What are the most important procurement programmes for the RNoN – current and future?

**Admiral Stensønes:** The most important procurement programmes are a new submarine capability to replace the ULA class, new CG OPVs to replace the NORD-KAPP class, the newly commissioned AOR HNoMS MAUD IOC, the introduction of autonomous capabilities in all dimensions, and last but not least an increase in the sustainability in all dimensions of our Navy. The latter meaning more spare parts, enhanced maintenance, increased readiness and more weapons and ordnance. The reaction times are clearly reduced in the Norwegian areas of interest, and this means that our Navy must be ready to operate on very short notice. What is not available for operations today is simply not relevant.

22 January, the Norwegian Chief of Defence stated in his annual speech in Oslo that the size and capability of our armed forces is too small. He referred to our Navy specifically, with the expression “quality



Photo: Cedric Artiques/NATO/FMS

**HNoMS UTSIRA late at night. UTSIRA is one of six ULA class submarines to be replaced by the joint German-Norwegian CD212 submarines.**

## Masthead

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#### Office address:

Mittler Report Verlag GmbH

Baunscheidtstraße 11, 53113 Bonn, Germany

Phone.: +49 228 35 00 870, Fax: +49 228 35 00 871

Email: info@mittler-report.de, www.mittler-report.de

#### Director of Marketing

Jürgen Hensel (jh)

Phone: +49 228 35 00 876, Fax: +49 228 35 00 871

Email: juergen.hensel@mittler-report.de

#### Marketing & Business Development

Dr. Andreas Himmelsbach

Phone: +49 228 35 00 877, Fax: +49 228 35 00 871

andreas.himmelsbach@mittler-report.de

Waldemar Geiger

Phone: +49 228 35 00 887, Fax: +49 228 35 00 871

waldemar.geiger@mittler-report.de

#### Advertising Representatives:

##### UK/Ireland/Eastern Europe/Israel/Turkey:

Stephen Barnard, c/o Mittler Report Verlag GmbH

Phone: +49 228 35 00 886, Email: stephen.barnard@mittler-report.de

##### USA/Canada:

Susan Spilman-Gardner

Email: Susan.Gardner@mittler-report.de

Phone: +1 817-751-5888

##### Russia & CIS:

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Phone: 007-495-911-1340, Fax: 007-495-912-1260, Email: yalarm-lml@mtu-net.ru

#### Subscription/Reader Service:

PressUp GmbH, Postfach 70 13 11,

22013 Hamburg, Germany

Phone: +49 40 38 66 66-319, Fax: +49 38 66 66-299

Email: mittler-report@pressup.de

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satisfactory but quantity insufficient". This is naturally also a concern of mine. I want to emphasise that the RNoN needs to be present in our areas of interest. If we are not there, other actors will fill the vacuum.

Norway is NATO in the North Atlantic; Norway is NATO's northern flank. This means something; we have obligations to the alliance.

**ESD:** Norway and Germany have agreed on the joint procurement of identical Type 212CD submarines. In the scope of this programme, what are the particular requirements of the RNoN and what advantages do you expect from the programme to be brought along for Norway and the RNoN?

**Admiral Stensønes:** Norway and Germany have agreed on common requirements for the Type 212CD, and a common procurement of six identical submarines. This means harmonising requirements to take into account both German and Norwegian needs. The requirements have taken into account developments in technology and the present security situation along with other important factors.

Working together with Germany, we have developed common plans for training, manning, lifetime management, and so on. This will reduce costs for both nations during the lifetime, and it will also benefit both nations through improvements and updates during the lifetime of the boats.

**ESD:** From the perspective of German industry, the 212CD partnership has the potential to be extended to include additional partners – like the Netherlands or Poland. Would that be in accordance with your preferences?

**Admiral Stensønes:** Both nations are welcoming additional partners. In order to maximise the benefit of additional partners, identical submarines will provide the most benefit for all partners, but similarities of most of the systems will also provide benefits.

**ESD:** In view of the forthcoming Brexit – many European countries are considering realignments of their armed forces. Will Brexit – provided it happens – have an effect on the RNoN?

**Admiral Stensønes:** Brexit will imply few changes for the Royal Norwegian Navy. NATO is the backbone of European Defence and will remain so regardless of Brexit. The Norwegian and the Royal Navy cooperate in various arenas. I do not believe Brexit will have an impact on our relations.

**ESD:** Has NATO's new alignment towards national and Alliance defence had an effect on the RNoN's procurement allocation? Do you anticipate the budget to increase over the next few years?

**Admiral Stensønes:** First, it has reoriented our focus towards high-end warfare against near-peer adversaries in the Euro-Atlantic area. It also revitalises our focus on interoperability. It is important in all warfighting areas, but particularly in a theatre approach to Anti-Air Warfare (AAW) as well as Anti-Submarine Warfare (ASW). Potential adversaries are improving; this means that most nations in the Alliance cannot meet the emerging threats on their own. The RNoN is fully committed to participating with our allied partners with the capabilities we have at our disposal against any state or non-state actor as directed by our government.

**The interview was conducted by Björn Domaas Josefsen and Jürgen Hensel.**

# The Human Aspect in Modern Combat Aircraft

**Tamir Eshel**

**With aircraft becoming sensor-rich and computerised, more than ever before, the cockpit transforms into a sophisticated and automated human-machine system, that translates machine sensing to human situation awareness, and human commands into machine actions.**

Despite the orthodox approach to flying, military aviators cannot escape the changes we all experience in our daily life, changes that shape the way pilots fight, win and survive in future conflicts. Since the beginning of aviation, a unique place was reserved for the pilot – combining the ergonomics (seat, windshield), flight instruments (gauges in the instrument panel) and flight controls (pedals, stick, and throttle). With those indications, the pilot assessed the aircraft situation and, by looking outside, they developed 'Situation Awareness', the essential perception of flying and aerial fighting. This simple representation was enough for fighter planes in World War One, where airplanes operated in close formations and relied on hand signals for co-ordination. In World War Two, radio communications and radar introduced new dimensions to air combat, enabling the air flights to operate as part of a bigger plan, centrally controlled and following a 'master plan.' In the mid-1960s, the appearance of missiles introduced another change, exposing aircraft to overmatch at much longer ranges, challenged by missiles with manoeuvrability levels beyond human tolerance.

## The Glass Cockpit

The aircraft and weapons of that generation were limited to attacking the enemy in the direction of flight. While, over the years, missiles evolved to become smarter, more manoeuvrable and accurate, they have always relied on the pilot to acquire the target. The gimbals of missile seekers of the first generations were limited in movement, which required manoeuvring the aircraft to bring the target to their field

of view. Highly developed pilot skills were also critical to hitting targets with bombs. The first generation of radars and weapons each used specific displays for operation. However with the introduction of multi-function displays (MFD), the fighter cockpit organised in a two or three display

perfect hit. A typical HUD is BAE Systems' LiteHUD, a modern, lightweight, small and compact HUD, which utilises the Digital Light Engine (DLE), a digital display that replaces the traditional Cathode Ray Tube (CRT) used in legacy analogue HUDs. New waveguide optics deliver a compact, low-

Photo: via author



**BAE System's testpilot Mark Bowman with a helmet system of a Eurofighter TYPHOON**

'glass cockpit' operated by a complex array of switches, levers and triggers operated by the Hands On Stick and Throttle (HOTAS) concept. Helicopters and transport planes also adapted MFDS in a horizontal line, comprising three or four units. These displays depicted the information driven from the sensors on board. The Head-Up Display (HUD) was an essential capability for both air/air and air/ground tasks, as it displayed the missile's seeker field of view, or a continuously computed impact point, depicting the point where the bombs were likely to hit. Presenting this information in front of the pilot, along the flight path, enables the pilot to manoeuvre the aircraft to score a

profile design, which can be integrated into most cockpits, from turboprop trainers and fighters to transport aircraft. With its low profile, it can also integrate with the wide area displays characteristic of modern fighter cockpit designs.

## Evolving Fighters Displays

By the 1990s, all-aspect missile seekers, active radar guided air/air missiles and precision-guided air/ground weapons were introduced, enabling more flexible target engagement. With improved sensors carried on board, such as targeting pods and airborne radars, pilots could also locate and designate targets off boresight.

## Author

**Tamir Eshel** is a security and defence commentator based in Israel.



Photo: US Navy



**The cockpit of an F-35 LIGHTNING is the most advanced manned-machine environment designed to date.**

The means to leverage this capability were HUDs with a wide field of view, offering enhanced eye motion, and head-mounted cueing systems, a kind of helmet mounted sight, which tracked the pilot's line of sight and directed the sensor or seeker to cue to this direction.

Such systems enabled pilots to leverage the full potential of all aspect air/air missiles, by offsetting an opponents' maneuverability with an all-aspect missile with better kinematics.

HUDs and helmet mounted cueing systems combine head tracking systems and display systems using computer-generated vector graphics, to present information to the aircrew in any direction they look.

The F-35 cockpit represents the most advanced manned-machine environment designed to date. It is the first fighter plane that has no HUD, and the first to use a single large display screen (LAD) providing a large display area for the presentation of flight information and a tactical display. The LAD represents a departure from the traditional three-multifunction display 'glass cockpit' design, where each display depicts a specific sensor page. Complementing the LAD is the helmet-mounted display and a network of distributed aperture systems (DAS) providing the pilot 360 degree visibility from the cockpit, even under total darkness or in conditions when the aircraft fuselage obstructs the view. The original DAS was designed by Northrop Grumman, while Raytheon produces a different version,

slated to enter the future production lots. The helmet mounted display is produced by VSI, a Joint Venture of Elbit Systems and Collins Aerospace.

Existing fighter planes undergoing modernisation also adopted this approach to some extent, by replacing the multi-MFD

Photo: BAE Systems



**BAE Systems' TEMPEST "wearable cockpit" utilises 3D audio and voice command and means for haptic feedback sensors, embedded in gloves, which give the tactile impression of touching real buttons and switches.**

glass cockpit with LAD displays or replacing parts of the legacy instruments with new consoles offering a maximum display area. The F-16 central Pedestal Display (CPD) is one such concept used in the latest versions of the F-16, including the F-16V.

Innovative design features from BAE Systems rest on the idea of the 'wearable cockpit' – utilising augmented reality to build fully functional virtual displays and instruments in front of the pilot's eyes by using a semi-transparent augmented reality display, which projects virtual objects on top of the live scene, 3D audio and voice command and means for haptic feedback sensors, embedded in gloves, give tactile feed-

back of touching real buttons and switches. Other control methods could employ eye tracking, neural control technology and physio- and psychometric sensors, which will constantly monitor the pilot health and mental capacity. In an event where the pilot misses track of an important piece of information or loses consciousness due to high G or low oxygen, the mission computer or autopilot could automatically take control to save the situation. The new concept was presented in public for the first time in 2018, as part of the introduction of the TEMPEST future combat aircraft concept.

## Improving the Helicopter Cockpit

Aviator Night Vision Systems (ANVIS) and Helmet Mounted Displays (HMD) are used to deliver a complete picture, such as a night view, generated by image intensification system or Forward Looking Infrared (FLIR). More recently, advanced HMD generating colour video displays are used to deliver more information to pilots.

Today, such display systems provide much more than night vision. A miniature display and optics combiner attached to a helmet

mount or ANVIS provides helicopter pilots with a vector graphics symbology and raster images, displayed through the ANVIS HUD system. Such devices become a critical 'enhanced vision' device, improving the flight safety at a low level, and handling brownout condition, when landing in desert terrain or snow-covered landscape.

In these conditions, a thick dust or snow cloud blocks the pilot vision near ground level, at the most critical phase of the landing. These systems are as good as the sensors with which they operate. To improve perfor-

mance in these conditions, Elbit Systems' developed the BRITENITE sensor, covering an ultra-wide field of view with an array of thermal imaging sensors delivering a clear image of the area of degraded visual environments (DVEs), such as under thick smoke or dust cover. Other concepts utilise repurposing existing sensors, such as infrared threat warning devices already used on helicopters, or distributed aperture systems (DAS) derived from other platforms such as the F-35, for use as a panoramic or spherical (360 degree) viewing system.

The Pilotage Distributed Aperture Sensor (PDAS) developed by Lockheed Martin has recently made the first flight on

the Bell V-280 VALOR tilt-rotor aircraft. PDAS consists of six infrared sensors distributed around the aircraft and linked to aircrew helmets and cockpit displays through an open-architecture processor (OAP). Although the system currently supports two users (aircrew), it will ultimately support up to six users, enabling transported troops to survey the environment for tactical information and threats. Other enhancements will include integration with Multi-Modal Sensor Fusion (MMSF), a multi-sensor feed that helps to restore aircrew situation awareness in DVE and enables navigation in GPS-denied zones. Other changes to the helicopter cockpit are being explored under DARPA's Aircrew Labour In-Cockpit Automation System (ALIAS) programme. Through the DARPA ALIAS programme, Lockheed Martin Sikorsky are developing systems intelligence that will give operators the confidence to fly aircraft safely, reliably and affordably in optimally piloted modes enabling flight with two, one or no crew.

ALIAS envisions a tailorable, drop-in, removable kit that would emplace high levels of automation into existing aircraft, enabling operations with a reduced onboard crew. The system uses the Matrix system,

a capability toolkit, which includes multi-spectral sensors, hardware, and software to enable scalable automation. As an automation system, ALIAS supports the execution of an entire mission, from take off to landing, even in the face of contingency events such as aircraft system failures. To cope with such emergencies, ALIAS uses persistent-state monitoring and rapid recall of flight procedures.

### Sensor-Based Situation Awareness

Situation awareness (SA) is a basic and most critical aspect, specifically for air combat. The air aces of the past were those who could leverage Situational Awareness to quickly seize the moment, take advantage of the situation and implement the right manoeuvre and weapon to score a kill. In the jet and missile age, where the reach of the platform, sensors, and weapons by far exceed human sensing, Situational Awareness is a combined and shared resource, just as much as the aircraft and the weaponry they carry.

The battlespace is constantly monitored and mapped by imaging sensors, radars and identification systems (Interrogator Friend

and Foe – IFF) from different aircraft and ground radars. Some of the sensors may be aircraft positioned far away from the scene, or ground-based sensors assisting the flight. Others could be stealth planes or unmanned platforms, inserted deep inside enemy airspace to provide an inner view of the situation.

Individual fighters would get a segment of that sky picture, as viewed around the aircraft. Such a picture indicates the location of all friendly assets, known enemy missile defended areas, civilian aircraft tracked by radar and air traffic control (ATC), unidentified objects or those identified as enemy planes, which could threaten the mission and friendly force.

Each pilot watches a segment of that common picture, augmented with information obtained from the sensors on board, such as radars, electronic support measures, missile launch warning systems or infrared search and track (IRST) and other electro-optical systems.

Each of these sensors provides critical information to create situation awareness, enabling the pilot or crew to respond to evolving threats promptly – for example, pursue an attack against a pattern of signals that could indicate a hostile ac-

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tion. Such actions could vary from evasive manoeuvres and flare release to the deployment of electronic warfare, and a pre-emptive strike by high-speed anti-radiation missiles.

Connecting a situational picture to centralised decision making is part of the Resilient Synchronised Planning and Assessment for the Contested Environment (RSPACE) system BAE Systems develops under a DARPA contract. The project

## Fusion Renders a Better Picture

A new challenge for military pilots is information flooding. As aircraft become connected, the amount of information generated on board is staggering. With the information obtained from local sensors and constantly streaming from sources across the network, situation awareness is no longer a matter of practices and disciplines.

and often required two crew members to handle the workload. The introduction of data buses and digital architecture in fourth generation fighters introduced situational displays, which could depict a clear battle plan. However, sensor management still required pilots to flip through many 'pages' to perform specific tasks. Critical indications, such as threat warning, remained with a unique display, which added audio signals to increase attention.



**BAE Systems' "wearable cockpit" utilises augmented reality to build virtual displays and instruments in front of the pilot's eyes by using a semi-transparent augmented reality display that projects virtual objects on top of the live scene.**

seeks to develop human-centered software decision aids, which can assist air operators in improving operational control in a complex battlespace. As part of the RSPACE programme, the company developed the Distributed, Interactive, Command-and-Control Tool (DIRECT) to improve air battlespace awareness. DIRECT uses a visual interface to generate real-time alerts for operators to evaluate areas of concern during the planning and execution of a mission. The software also automatically adjusts to minimise bandwidth when communications are either limited unreliable to assist in mission continuity and completion.

It has become a complex technological and system integration challenge that addresses the information flow, data fusion and prioritisation, human-machine interface, and ergonomics. Current developments also leverage machine learning and artificial intelligence, to bring the information to a humanly manageable workload. The electronic hardware and processing power available to system designers in the past could not support the integration of multiple, analogue sensor feeds onto a common screen, necessitating the use of many displays to monitor all sensors. The integration of all this information into a single situational picture was impractical

Managing an aerial picture on a small cockpit display is a difficult task, particularly when the situation is unfolding at high speed, long range, and involving large formations. That is where large area displays (LAD) come in handy. First used in the F-35 LIGHTNING II, LAD has now been implemented in several aircraft models, for example, in a vertical display placed on the central pedestal display for the F-16 (as used in the latest F-16V configuration), F-15X, GRIPEN E and future variant of F-18. In a modern application such as the F-35, LAD is combined with helmet displays, as the mission and display computers manage





Photo: Elbit

**The Elbit BRIGHTNITE sensor delivers a clear image of areas under thick smoke or dust cover.**

the dataflow to display only the information essential to the pilot at the specific time, resulting in reduced workload, which enables a single pilot to perform the mission previously handled by a full crew. Such a combination enables the pilot to fly 'heads out' in the engagement phase and use the LAD display when the situation enables or requires planning, situation assessment, and management of remote assets.

Another advantage of a helmet display and the cueing system is the ability to designate objects by a co-ordinated eye view (line-of-sight) and hand controls. Before such helmet cueing systems were used, pilots had to manoeuvre the aircraft to bring the head up display to the point of interest to designate a target. However, with helmet display sights, all that is necessary is to look at it, and the target is locked-on with a click of a button.

Modern helmet displays also enable the integration of raster (bitmaps) on the eyepiece or visor, displaying images and live video as a 'window on the world' view. A small window can be used to assist in target recognition and identification, using the aircraft telescopic electro-optical targeting systems such as targeting pod or infrared search and track (IRST) as sensors. On a night flight, the whole visor can show the FLIR images obtained from navigation FLIR or Distributed Aperture System (DAS), to enable the pilot to fly 'heads out' at night as they see the terrain and fly as in clear daylight, avoiding other aircraft, terrain, and threats in the vicinity, without dependency on traditional flight instruments.

To further reduce workload, designers can turn to new sensory channels, such as 3D audio and tactile sensing. 3D audio relies on the human capacity to differentiate audible cues by the direction from which they come. As such, directional audible alerts generate spatial cues, which are processed by the brain without effort. A major limitation of 3D audio is the brain's inability to process multiple audible cues simultane-

ously. Therefore, this method can be used only for critical alerts. A tactile channel can carry multiple cues simultaneously, using a new and patented cuff, basic instructions such as coarse directional cues, radio channel confirmation, etc., can be transmitted and processed intuitively even under extreme stress and workload.

Helmet display enables capabilities never used in aviation. Projected on transparent visors positioned near the eye, the display superimposes digital objects on the scene. On such images, the sky view and terrain are augmented with virtual objects to show navigational waypoints, depicted as 'highway in the sky.' Fixed or computed obstacles, such as wirelines, antennae, and buildings, or computed obstacles, such as ridgelines are also represented to warn the pilot of flight safety hazards. Dynamic objects, such as friendly aircraft and hostile SAMs are also displayed as virtual objects, represented

as 'domes' indicating their effective coverage. Such presentations enables the pilot to circumvent those threats just as other obstacles. To fly their planes through this virtual world, the pilot needs to obtain a good view of the real outside world with safe paths correctly presented on it in real time.

Elbit Systems has developed the SUPERVISION concept to presenting data to the aircrew in an intuitive manner, reducing crew workload and improving pilot response. Information layers, including vision systems depicting the outside world or night vision view sensed by night vision or thermal imagers, information layers including terrain, known obstacles, threats indicating the airspace coverage and recommended flight path are all superimposed and correlated on the world view. By fusing the various layers of information, SUPERVISION superimposes information on the world view projected on the visor, enabling 'head out' flight in any terrain and under all visibility conditions. Innovative display solutions utilise HUDs or HMD, relieving aircrews of the mental load of having to interpret the data. Utilising the spatial orientation of information elements to enhance situation awareness enables the aircrew to focus on the essential elements of the mission in hand. With advancing technologies, the concept of SUPERVISION will continue to evolve toward a networked service comprising multiple airborne or air and ground elements co-operating on a mission, delivering a shared, complete 3D situational picture to all participants involved.



Photo: Elbit

**The Advanced Cockpit of Elbit Systems of America optimises tactical situational displays, processes advanced applications and provides high-definition formats for complex sensor video presentations.**

## Aircraft with Artificial Intelligence (AI)

Integration of artificial intelligence in the cockpit would offer major advantages for the air force in general, yet significant challenges for pilots that have relied exclusively on their skills and senses for decision making. AI capabilities were proven in studies conducted in flight simulators, where human pilots fought opponents flown by AI piloted or assisted machines.

One approach harnesses 'connected decoys,' namely offboard electronic warfare decoys and 'defensive missiles,' which act as baits, luring enemy missiles to divulge their guidance strategy, enabling the defender to opti-

Eventually, ALPHA aims to lessen the likelihood of pilot's tactical mistakes since its operations already occur significantly faster than other language-based applications. An ALPHA based virtual 'co-pilot' can take in the entirety of sensor data, organise it, create a complete mapping of a combat scenario and make or change combat decisions for a flight of four fighter aircraft in less than a millisecond.

Eventually, future air combat will require reaction times that surpass human capabilities. Such engagements will integrate AI wingmen utilising Unmanned Combat Aerial Vehicles (UCAVs) as the tip of the spear, teamed with manned aircraft likely in stealth fighters and bombers, assuming

test, Lockheed Martin demonstrated how aircraft equipped with OMS could exploit on board communications to link and transfer information between different platforms, using standard Link 16 and covert communications used on stealth platforms (such as the F-22). This capability was demonstrated by a U-2 that provided multi-domain command and control, sharing data across dissimilar platforms in the denied environment. Pursuing another research area, DARPA is developing the system of systems integration technology (SOSIT) connecting between battle managers, manned aircraft and unmanned wingmen. Boeing, General Dynamics, Lockheed Martin, and Northrop Grumman are developing and analysing, promising architectures and designing plans for flight experimentation. Apogee Systems, BAE Systems, and Collins Aerospace are developing tools and technologies to enhance open-system architecture approaches. Such systems are developed from the beginning to be robust and resilient to cyberattacks.

The programme has already demonstrated the ability to process sensor data in different manners automatically. For example, the F-35 radar was linked with DARPA's Automatic Target Recognition software, to reduce operator workload and create a comprehensive picture of the battlespace. Data-rich messages were then transferred over existing datalinks, sharing information between different systems on various platforms. Such links also enabled connection of ground-based cockpit simulators with live aircraft systems in real time, enabling users to reduce data to decision timelines.

With advanced information sharing, manned/unmanned teaming would reduce the human crewmembers' cognitive burden and workload, allowing the warfighter to focus on creative and complex planning and management. Each drone will have sufficient onboard autonomy to complete all basic flight operations untethered from a ground station and without full-time direction from the manned lead.

The US Air Force has already begun flying aircraft equipped to control a full 'Loyal Wingman' drone formation and is planning to test the concept through 2022. Eventually, assigning drone formations to all front-line aircraft – the F-35 LIGHTNING II, F-22 RAPTOR and possibly its newest bomber – B-21 RAIDER. Combined with next-generation Very Long-Range Air/Air Missiles (VLRAAM) launched from long distances, and Beyond Visual Range Air/Air Missiles (BVRAAM) engaging the enemy beyond visual range, such formations are expected to overmatch existing and future enemy fighters and air defence networks. ■

Photo: Elbit



**Advanced cockpit of a new generation F-15**

mise evasive manoeuvres and countermeasures to defeat them. Such methods would enable manned and unmanned combat aircraft to increase survivability and gain the upper hand when dealing with enemy fighters and surface-to-air missiles in defensive and offensive actions. An Israeli research team, led by Technion Prof. Tal Shima, studied this Co-operative Evasion and Pursuit concept, under a US Air Force Research Lab study.

ALPHA, an AI application, developed by Psibernetix Inc., the US Air Force Research Lab and the University of Cincinnati, also demonstrated the advantage of AI. It uses an AI method called 'Fuzzy Logic' to perform air battle management decisions in a fraction of second and select the best plan with the maximum probability of success. In its earliest iterations, ALPHA consistently outperformed other computer programmes in air combat simulations. After the system matured, it was pitted against seasoned manned pilots and won every match. The ALPHA is so fast that it could consider and co-ordinate the best tactical plan and precise responses, within a dynamic environment, over 250 times faster than ALPHA's human opponents could blink.

the battle management roles. Such systems would be able to process situation awareness, determine reactions, select tactics, manage weapons use and more. Such AI derived systems could simultaneously evade dozens of hostile missiles, take accurate shots at multiple targets, co-ordinate actions of squad mates, and record and learn from observations of enemy tactics and capabilities.

AFRL has been experimenting with the "unmanned wingman" concept for some time, using both surrogate manned aircraft and unmanned aircraft with manned fighters fitted with Lockheed Martin's Open Mission System (OMS) providing the integration for the manned-unmanned mission. Among the test programmes conducted in 2017 were HAVE RIDER II that explored an experimental F-16 aircraft, acting as a surrogate Unmanned Combat Air Vehicle (UCAV), autonomously reacting to a dynamic threat environment during an air-to-ground strike mission.

Distributed operations of this kind rely on robust communications, which link between all members at all times, even under extensive countermeasures. On another



# A Long Life for the Spanish EUROFIGHTER

**Esteban Villarejo**

The retrofit of Tranche 1, the integration of the E-Scan radar and a possible replacement of the Spanish fleet of 85 F-18 aircraft are the most important pillars for the future of the jet-fighter in Spain.

In July 2020, the Spanish Air Force will receive its last EUROFIGHTER jet, reaching the 72 deliveries agreed in the original contract, Airbus DS sources told ESD during a visit to the company's facilities in Getafe, near Madrid.

Anyway, the Spanish government will likely change its defence staff members in the coming weeks after the last general election was won by the current socialist government. According to political analysts, the of Defence, Secretary of State, and part

Official Airbus sources have expressed their satisfaction with the statements of the Spanish MoD, which spell out Spain's plans for the future of its EUROFIGHTER fleet: "We hope to work with this valuable client to implement the proposed improvements that will ensure the fundamental role of Eurofighter at the heart of the Spanish Air Force during the next decades and that will underpin the continuous stability of the production of combat aircraft in Spain."

Spain participates in the Eurofighter programme by holding 14% of Airbus DS (Germany with Airbus DS, 30%; UK with BAE Systems, 36%; Italy with Leonardo, 20%). The final assembly line in Getafe provides the delivery of the entire Spanish EUROFIGHTER fleet and manufactures all the right-hand wing of all 623 aircrafts ordered by nine countries (Germany, UK, Italy, Spain, Austria, Saudi Arabia, Kuwait, Oman and Qatar).

## The Tranche 1 Retrofit

"The replacement of Tranche 1 EUROFIGHTERS is not an issue at the moment. Tranche 1 fleet has just started a modernisation programme, which includes hardware and software upgrades, taking care of obsolescence issues by integrating Tranche 2 hardware. Operational upgrades include new capabilities, like the possibility of carry listening targeting pods", the official spokesperson of the Spanish Air Force, Lieutenant-Colonel Marcos Díez Estévez, told ESD.



Photo: AIRBUS DS

**Airbus has started the modernisation of Spain's EUROFIGHTER Tranche 1, which includes hardware and software upgrades.**

However, this milestone does not spell the end for Spain's Eurofighter TYPHOON programme as the Spanish Airforce (Ejército del Aire) will enhance its current fleet of 70 aircrafts (there were two accidents in 2014 and 2017) and, most importantly, will replace 85 F-18 HORNET by 2025.

"The EUROFIGHTER is a solid candidate for the replacement of the F-18 deployed in Zaragoza, Madrid and Canary Islands", a Spanish Air Force spokesperson said. The final decision is also linked to the possibility of reinforcing the industrial capabilities of Airbus DS in Spain. Of course, there are two other US-made candidates, the F-18 SUPER HORNET by Boeing and F-35 LIGHTNING II by Lockheed Martin.

**The Airbus DS plant in Getafe. Airbus hopes that the Spanish MoD will chose the EUROFIGHTER to replace its ageing F-18 HORNET fleet.**

of the Chiefs of the Armed Forces could be replaced and a new team would have to make the final decision about the F-18 replacement.

However, on 14 December 2018, the current minister, Margarita Robles, approved an extra €906M to improve the capabilities of the EUROFIGHTER fleet until 2023 "since the €9,254M of the allocated budget had been spent."



Photo: AIRBUS DS



## Spain Considers the TAURUS Missile for the Eurofighter

Is Spain considering participating in a project to integrate the Taurus missile into the EUROFIGHTER?

"Spain is considering integration, and if deemed appropriate, it will probably take place in co-operation with the rest of the TAURUS and EUROFIGHTER users, such as Germany, with the aim of being integrated into further developments of the EUROFIGHTER after

Photo: AIRBUS DS



**The TAURUS missiles could provide the EUROFIGHTER with a long-range precision strike capacity.**

2020," said an official source of the Spanish Air Force to ESD.

Airbus is being even more explicit: "The integration of TAURUS missiles into the Spanish Air Force EUROFIGHTERS is clearly being considered by the Spanish MoD and Germany's accession to such a programme could obviously create synergies."

"The Spanish Air Force has already TAURUS air-to-ground stand-off missile capability, in service with the F-18 fleet. The same capability with the similar weapon STORM-SHADOW has already been cleared for operations with the British RAF EUROFIGHTER fleet. The Spanish MoD is aware of the transfer of TAURUS capabilities from German TORNADOs to its replacement fleet, so we are confident that it will be the EUROFIGHTER," an Airbus source said.

Oliver Strothmann, Director of New Business Europe at Taurus Systems GmbH points out that "it is not complicated at all to integrate the TAURUS into the EUROFIGHTER. A mechanical integration was already done some years ago. Only the electrical integration has to be done to be completely integrated. Of course, every integration is also very much dependent on customer wishes, which have not been completely discussed yet. I cannot see why TAURUS should not be planned to be integrated in Spanish Air Force EUROFIGHTERS."

In fact, TAURUS integration into the EUROFIGHTER would maintain the capability for long-range precision strikes for years to come, as the missiles procured have not even reached one-third of their lifetime.

Last February, Airbus delivered the first upgraded Tranche 1 EUROFIGHTER to the Spanish Air Force. The upgrade was carried out at the Airbus facilities in Getafe and involved the introduction of hardware modifications, which support the Operational Flight Programme 02 (OFP-02) developed by the Armament and Experimental Logistics Centre (CLAEX) in the Spanish Air Force.

The upgrade developed by Airbus includes modifications that integrate Tranche 2 and Tranche 3 equipment on the aircraft, such as a Computer Symbol Generator, Digital Video and Voice Recorder, Laser Designator Pod and Maintenance Data Panel.

"This first single-seat EUROFIGHTER (serial number SS003), to be followed by a second two-seat aircraft currently undergoing the upgrade, will be used initially by CLAEX as a test aircraft for the qualification of these new capabilities that will be implemented on the Air Force's fleet of 17 Tranche 1 EUROFIGHTERS", Fernando Peces, responsible for the EUROFIGHTER programme at Airbus DS in Spain, stated. Another pillar of the Phase 2 Enhancements (P2E) of the Spanish EUROFIGHTER will be the integration of the METEOR missile. Developed and produced by a consortium of European companies led by MBDA, the METEOR missile is undoubtedly the main innovation of the P2E.

METEOR is a radar missile designed to destroy targets at previously unattainable distances. Its maximum range is well over 100 kilometres, twice as long as other missiles designed for combat beyond the visual line of sight (BVLoS), including the US AM-RAAM, which remains the most important reference to date.

Being a fully European technology, METEOR contributes to the autonomy of the continent in terms of defence with a truly revolutionary product, which has no equivalent in the market. In addition to the EUROFIGHTER, this missile has been integrated into the Swedish GRIPEN, the French RAFALE and the British F-35.

## E-Scan Integration

After the retrofit of Tranche 1 in 2023, Airbus DS wants to introduce E-Scan radar in the entire fleet. This adaptation will imply improvements in the following capacities: detection, attack and identification; SAR modes (synthetic aperture radar); transmission of images; electromagnetic measurements; and integration of smart weapons.

The integration of the E-Scan radar is a bi-national programme involving Spain and Germany to start in 2022 in the Luftwaffe fleet. It will bring about an improvement in the processing and electronic warfare functions.

It is expected that Spain's fleet of 77 EUROFIGHTER will be in service until 2045 when the Future Combat Aircraft System (FCAS) will start to replace them. Spain will announce its participation in this French-German led main military project during the Paris Air Show in Le Bourget. The Spanish authorities will sign a Memorandum of Understanding to be on board this ambitious European jet fighter project.

## And the F-18 Spanish Fleet Replacement?

What are the possibilities for EUROFIGHTER to replace the 85 F-18 HORNETs fleet of the Spanish Air Force? After the integration of the E-Scan radar into the current fleet, Airbus DS expects to win a new contract to replace the F-18s.

"We are having conversations with the Spanish MoD to replace the F-18. Of course, it is a sovereign decision. But, I can tell you that the favourite option to replace the first F-18 aircrafts in Gando Air Base (Canary Islands) is the EUROFIGHTER", Alberto Gutiérrez, head of military aircraft at Airbus DS, told ESD. This is where a new chapter in the 'jet flight' between Europe and US is about to begin. ■

# TAURUS KEPD 350

PERFORMANCE MATTERS!



F-15



JAS 39 GRIPEN



TORNADO



EF TYPHOON



F-18



# “Our aim is to refrain from taking separate national approaches.”



Photo: BMVg

## Interview with Vice Admiral Carsten Stawitzki, National Armaments Director at the German Ministry of Defence

**ESD:** What are the most important military aerospace programmes in your country, both current and forthcoming?

**Stawitzki:** As of now, we are particularly focussing on the EUROFIGHTER and A400M programmes with regard to our fixed wing capabilities.

Once the 143rd German EUROFIGHTER, which is the last one for the time being, is delivered in the second half of 2019, we will return our focus to the phase of in-service use for this complex weapon system. At the same time, we are planning continuous further development of this system, and its operational availability continues to present us with major challenges. We support the ongoing export campaigns and plan to replace the first aircraft of Tranche 1 with new EUROFIGHTERS in due time. This weapon system is also a possible candidate for eventually replacing the TORNADO, which is scheduled to be phased out starting in 2025.

The A400M is also showing us what it means when a complex weapon system is simultaneously in the phases of development, delivering and in-service use. The A400M is already successfully supporting our international operations such as Mali and Afghanistan and is proving its enormous potential. At the moment, it is chiefly used for strategic air transport and – depending on the threat situation – for protected air transport. An A400M is also permanently on twelve-hour alert for

medical evacuation operations. Additional flights are conducted for operational suitability tests. The crews are particularly enthusiastic about the A400M's cockpit design (human-machine interface), available engine power and handling qualities.

At the same time, different variables have posed challenges, for example in starting in-service use of a new system. As a result, the availability of the system is not yet satisfactory. Everyone involved is working to change that.

Nevertheless, negotiating the contract amendment in the process known as “Global Rebaselining” means that we will have a solid basis for further development and delivery planning for this important weapon system in the foreseeable future. Thus, I expect a continual increase in the fleet's capacity.

In addition and having identified a capability gap in missions abroad with regard to the access to certain places with limited infrastructure we have set up together with France the procurement of a small C 130 J transport fleet, which will be homebased in Evreux. This programme once again proves us to foster the delivery of interoperable and commonly used capabilities to our armed forces shoulder by shoulder with partner nations.

In the area of our rotary wing capabilities as of now the multinational European NH 90 and TIGER programmes serve as the main basis, together with our ageing “working horse”, the CH-53 G.

To replace the latter, we officially started an open tender for a future heavy transport helicopter in spring this year.

For the NH90, we are preparing a retrofit programme addressing more than 50 requirements to improve the capabilities of this weapon system for future scenarios. These retrofit improvements will be

implemented in a national and international context in the next decade.

As far as the TIGER programme is concerned, we have commenced the multinational midlife upgrade programme “TIGER MK III” in cooperation with France and Spain. We expect the deliverance of the upgraded helicopters starting in mid-2020.

**ESD:** What is the focus of the forthcoming programmes?

**Stawitzki:** While the ongoing projects already bear witness to intensive European cooperation, it is important to consistently put the lessons identified from these programmes into practice and continue to increase the level of cooperation with all possible partners. Our aim is to refrain from taking separate national approaches to future cooperative programmes and instead to consistently collaborate on meeting the challenges involved in planning, delivery and especially operation of the systems in these complex programmes as the in-service support has to be assured for decades. The programmes for the Next-Generation Weapon System (NGWS) in a Future Combat Air System (FCAS) and for the Eurodrone are pointing us in the right direction.

Based on the High Level Common Operational Requirements Document signed in 2018, we are now initially cooperating with France to finalise the first steps in designing and developing the FCAS, which will be more than a mere replacement for the Eurofighter and Rafale. We are in discussions with other countries with France as the lead nation in the role of a caretaker in this regard. In terms of the industry, Dassault and Airbus will play key roles in designing, developing, producing and maintaining the system, in close association and involvement with other industrial partners.



The Eurodrone is a programme we are advancing with France, Spain and Italy to develop and procure an unmanned aircraft system for aerial imaging surveillance and reconnaissance from medium altitudes down to the depth of operations. The capabilities for long-term intelligence, surveillance, target acquisition and reconnaissance (ISTAR) are to be

ing an offer, which is expected in mid-2019. Development and qualification are scheduled for completion as of 2025, meaning that the first aircraft will probably be available starting in 2026.

**ESD:** What share of your procurement funding is invested in military aerospace R&T, and what are you focussing on?

**ESD:** Which of these activities are being carried out in international partnerships, and who are your partners?

**Stawitzki:** We aim to implement a large portion of our R&D activities in cooperation with international partners. Current projects include:

- Investigating technologies for the participation of unmanned aerial systems



Photo: BMVg

**A German Airbus A400M is being loaded for the Syrian mission at Jagel Air Base, 10. December 2015. The A400M is supporting Germany's contribution to international operations in Mali and Afghanistan.**

supplemented with the ability to engage stationary and mobile point targets. This programme is a significant step forward towards the development of a European capability in this operational area. The programme is led by the multinational armaments agency OCCAR's location in Hallbergmoos, Germany. The main industrial contractor is Airbus D&S with the support of Dassault and Leonardo.

**ESD:** What role does Europe play in these programmes?

**Stawitzki:** The Eurodrone receives support from the EU through the European Defence Fund (EDF) and is to present further opportunities for European integration through use in Permanent Structured Cooperation (PESCO). Following completion of the definition study at the end of 2018, the industry is currently prepar-

**Stawitzki:** In 2018, the German Federal Ministry of Defence invested a total of €61.5M in R&D activities in the field of military aerospace. These activities range from applied basic research to system and solution-oriented studies. They are primarily geared towards identifying, investigating and achieving the technical maturity of technologies:

- For the participation of unmanned aerial systems in general air traffic
- For innovative propulsion systems for the Bundeswehr's aircraft
- For the implementation of a future aerial combat system
- To improve rotary aircraft systems
- For satellite-based air-ground imaging reconnaissance
- To protect space infrastructure

These activities will still be points of focus for the next few years.

(UAS) in general air traffic within the framework of the European Defence Agency (EDA) in cooperation with Austria, Belgium, the Czech Republic, Spain, France, Italy, Poland, Portugal, Slovenia, Sweden and the UK

- Joint studies on rotary aircraft with the US
- Analysing innovative technologies for the further development of aerial combat systems in cooperation with the countries in the European Technology Acquisition Programme (ETAP): France, Spain, Italy, Sweden and the UK
- Space-related activities, currently in cooperation with Australia, Canada, Italy, the Netherlands, Norway, the UK and the US.

**The questions were asked by Peter Bossdorf**

# “Trident Juncture in Norway was a priceless opportunity.”



Photo: MoD Norway

## Interview with Morten Tiller, National Armament Director at the Ministry of Defence of Norway

**ESD:** In many western countries, the changed security-political situation in Europe has induced governments to allocate additional funds for defence and armament. To what extent and in what way has this trend influenced things in your country?

**Tiller:** Defence spending in Norway has increased every year since 2012 and we

expect it to increase further in the years to come. Norway is currently implementing a long-term defence plan, which constitutes a large increase in the defence budget of more than €18Bn over the next 20 years. It represents a major strengthening of our Armed Forces.

The plan is based on a three-step strategy, improved availability and endurance, increased activity and presence, and investments in vital capabilities.

Generally, we are increasing the level of readiness and activity across all services, especially in the High North. In addition, we focus on enhancing the logistical capabilities, availability of spare parts, ammunition, maintenance and stocks, required for properly responding to a sudden crisis or armed conflict.

Last year, NATO's article 5 exercise Trident Juncture in Norway was a priceless opportunity, as a host nation and a first line responder, to test the national Total Defence Concept and draw several key lessons for future implementations.

We also invest in new, high-end strategic capabilities. The procurement of the new F-35 fighter aircraft is on schedule. Coupled with the Joint Strike Missile, it represents major improvements of our military capabilities. In addition, we are investing in new submarines, maritime patrol aircrafts (MPA) and air defence systems. We are also making significant investments in intelligence and surveillance capabilities, in order to maintain situational awareness in the North Atlantic and the High North.



Photo: NATO

**A US Navy Landing Craft Air Cushion (LCAC) hits the beach in Ålvund, Norway during Exercise Trident Juncture 2018. About 50,000 soldiers from 31 NATO Allies and partner nations participated in this exercise held in central Norway.**

Looking even further ahead, a premise for Norway's next long term plan is to further increase our defence spending towards the NATO's 2% GDP goal through annual growth in defence spending.

**ESD:** What are the most important military aerospace programmes in your country, both current and forthcoming?

**Tiller:** The most important investments within the military aerospace programmes are replacing F-16s with F-35s, maritime helicopters (NH 90), continued maritime patrol capability by replacing P-3 ORION with P-8 POSEIDON, new Ground Based Long Range/Area Air Defence system and upgrade of NASAMS Medium Range Air Defence system including replacement of medium range missiles.

**ESD:** What share of your procurement funds is invested in military aerospace R&D and what are you concentrating on?

**Tiller:** Norway attaches significant attention on modernisation. The defence budget's share of procurement is around 28% and the figure will increase in the years to come. However, it is challenging

to provide exact figures for aerospace R&D, since Norway has a long tradition of close R&D cooperation between the Norwegian Armed Forces, Norwegian Defence Industry and the Norwegian Defence Research Establishment, the so-called triaxial cooperation.

This triaxial cooperation between the science and technology environment, the industry and the end user has served us well as basis for military innovation, capability development and delivery. The model has enabled us to manage available funds and resources in a focused manner, thereby achieving cost-effective development of world class products like the Naval Strike Missile, NASAMS, multi-purpose ammunition and the nano-UAV BLACK HORNET, to mention a few.

**ESD:** Which of these are carried out in international partnerships, and who are your partners?

**Tiller:** About 70% of our armaments are procured through foreign companies and we have a broad international cooperation portfolio. Currently, the most important capability investments is our participation in the F-35 programme.

**ESD:** What are your nation's current activities and considerations in the framework of PESCO (Permanent Structured Cooperation) and what are your plans?

**Tiller:** Even if Norway is not member of EU, we welcome EU's defence initiatives and consider a strong and well-coordinated EU that takes greater responsibility for common security to be important. However, we argue it has to be done in close cooperation and dialogue with NATO.

Norway signed an Administrative Arrangement with European Defence Agency in 2006, and is currently participating in the project "Preparatory Action on Defence Research – PADR." PESCO is still reserved for EU member states only. However, third countries may be invited and Norway will continue to argue for participation in PESCO projects. Our defence industry is deeply integrated with European defence industry and we are concerned that exclusions from EU's defence initiatives may create major challenges for industrial partners and businesses owned by Norwegian industry within EU nations.

**The questions were asked by  
Peter Bossdorf**



## Close Combat Symposium 2019

### Defence Academy of the UK - 09 – 11 July 2019

As a result of the new Transformation Fund, **Army HQ** has announced a change in their theme for the symposium from Survivability to **21st Century Infantry**. This is because of the money the Fund is making available over the next few years. **Army HQ** is looking to invest this across a number of areas. In respect of Ground Manoeuvre Capability these include autonomous vehicles, less than lethal technologies, nano-UAS technologies, supporting technologies and techniques for urban areas, and improving individual and collective STA. As a result of a recent planning meeting at **HQ Army**, **Cranfield Defence and Security** are now issuing a further call for exhibitors and demonstrations in these areas.

The aim of the symposium remains to consider trends and developments in small arms, dismounted weapon systems, ammunition, sensors, optics, and protective clothing and equipment. The revised theme of **21st Century Infantry** also seeks to examine additional opportunities for capability enhancements in the near-term, some of which will require new development. Although it is still being finalised, the programme currently includes: implications of the Transformation Fund; a Defence Intelligence threat brief; an engagement with **DE&S** specifically soldier systems and **DTech** on innovation and experimentation; Force Development and experimentation opportunities; soldier system integration; connecting the dismounted soldier; robotic vehicles; training munitions; maintaining fightability; alternate weapon cleaning regimes; and UAV enhanced digital mortar fire control. In addition **DCC Chesterman** of the **National Armed Policing Group** will present on the Police perspective, whilst **Captain William Shepherd USN Ret'd** (ex Navy Seal and international space station astronaut) will present on the perils of when technology goes wrong. Day 2 is the usual live firing range day at **COTEC**, kindly sponsored by **FNH UK**, with an evening dinner at the **GWR museum STEAM** in Swindon.

This symposium brings together representatives from across the international defence and security sector. Through presentations by **Army HQ**, **DE&S**, **Dstl**, industry and academia, and through plenary discussion the purpose is to encourage a sharing of ideas and opportunity to challenge current thinking.

**Email:** [Leanne@symposiaatshrivenham.com](mailto:Leanne@symposiaatshrivenham.com) - **Telephone:** +44(0)1793 785648 - **Follow us on Twitter** @SympatShriv



# CASEVAC/MEDEVAC Aircraft: Current and Pending Systems

**Sidney E. Dean**

Armed forces rely on Casualty Evacuation (CASEVAC) and Medical Evacuation (MEDEVAC) aircraft to transport wounded (combat), injured (non-combat), and ill personnel. While the borders between both types of mission can be fluid (and the terms are sometimes used interchangeably, even by armed forces), there are some general factors defining each.

CASEVAC is normally an emergency flight, transporting the patient directly from the field to the nearest medical/trauma facility, be it a field clinic or a regional hospital. CASEVAC patients are

soldiers have the highest chances of survival. While any qualifying aircraft can be used, dedicated CASEVAC aircraft are usually rotary aircraft capable of landing in unprepared terrain. Some helicopters

flights tend to cover medium-range to long-distance flights. They can transport patients from field hospitals to regional medical centres, or repatriate them from overseas to major hospitals in their country of origin. While rotary aircraft can conduct shorter range missions within a theatre of operation, longer range MEDEVAC flights must be conducted by fixed wing aircraft. Since MEDEVAC flights are normally pre-planned, there is time to await the availability of aircraft specifically configured for such missions. This includes dedicated MEDEVAC aircraft as well as general-purpose transports which can be configured with a medical evacuation module. Aircraft dedicated to the medical evacuation missions are marked with the Red Cross symbol as international law prohibits firing at these aircraft. These aircraft are generally designated as MEDEVAC, even when employed in the CASEVAC role.

## North America

### UH/MH-60

The United States Army is a prime example, utilising both general purpose and dedicated helicopters for CASEVAC missions. The multi-mission Sikorsky UH-60 utility helicopter performs medical missions on demand, while the HH-60M – a variant of the UH-60M introduced in 2007 – is optimised for this role and bears the Red Cross symbol.

The HH60M variant includes a specialised MEDEVAC Medical Equipment Package, consisting of a broad set of optional medical equipment collectively referred to as “Patient Movement Items” (PMI), as well as special configuration of the aircraft itself. The Army lists over 75 pieces of gear under the PMI label. This equipment runs from standard litters and pain-management items to various patient monitoring devices such as a portable EKG. The heli-

Photo: US Air Force



**Unlike MEDEVAC missions, which are unarmed, CASEVAC missions are frequently conducted by the nearest available aircraft.**

transported after only basic battlefield care by fellow combat personnel or a combat medic, in hopes of delivering the soldier to a medical facility within one hour of injury (the “golden hour” during which wounded

are specifically equipped for the CASEVAC mission. However, since evacuation is time critical, CASEVAC missions are frequently conducted by the nearest general-mission aircraft, with only ad-hoc configuration to accommodate litter patients and (perhaps) a medical attendant. Many military forces not maintain specialised CASEVAC aircraft. By contrast, MEDEVAC flights normally transport patients in stable condition after they have received care in a medical facility. While CASEVAC flights tend to cover comparatively short distances, MEDEVAC

## Author

**Sidney E. Dean** is President of Transatlantic Euro-American Multimedia LLC. and a regular contributor to ESD.



Photo: US Air Force

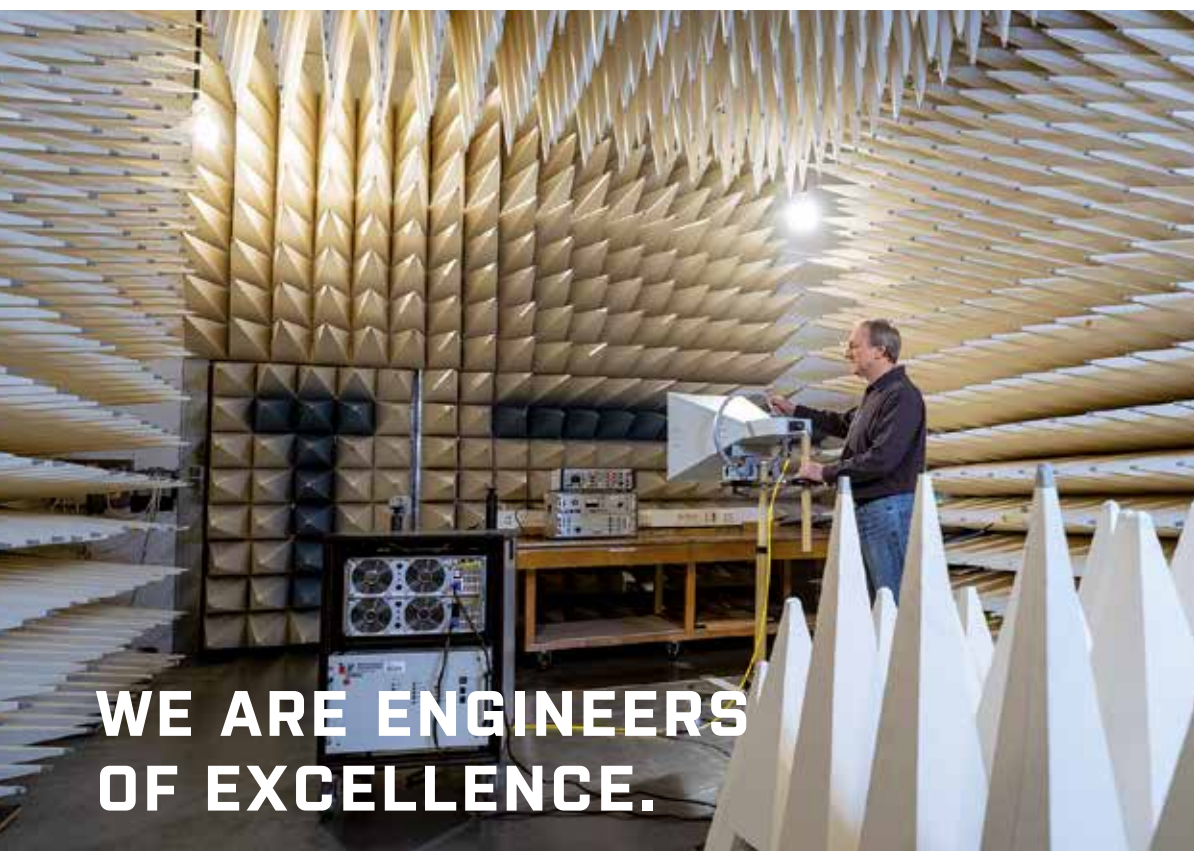
**Aeromedical crews aboard a C-17 GLOBEMASTER III prepare dummy patients for an airlift exercise from a Mobile AeroMedical Staging Facility.**

copter does not carry every item at once; the exact loadout is determined according to mission parameters. The aircraft modifications to support the CASEVAC/MEDEVAC role include an externally mounted rescue hoist for retrieving litter patients without landing; the Interim MEDEVAC Patient Support System (MEDEVAC-spe-

cific seat pallets, seats, litter supports; a MEDEVAC Mission Sensor, Forward Looking Infra-Red, designed to help pilots and crew locate patients in limited visibility scenarios; and the BLACKHAWK Advanced MEDEVAC (BAM) sliding window designed to improve loadmaster and medical crew visibility.

Additionally, the Medical Hands-free Ultra-wideband Broadcast (MEDHUB) system, currently in development, is expected to enter service in 2020. It consists of networked vital signs monitors worn by patients, and data storage/communications devices, such as tablets or smart phones, operated by the medical crew. The patient data gathered in flight is automatically relayed to the receiving hospital. MEDHUB will serve a double purpose: freeing the on-board medic from recordkeeping and reporting so that (s)he can concentrate on patient care; and ensuring that the receiving facility is optimally prepared for the incoming patients.

The HH-60M can carry up to six litter patients plus an attending medic over a maximum range of 510 kilometres at a cruising speed of 150 kn. Alternatively, the HH-60M can carry stabilised, ambulatory patients in seats. The medical module includes an integrated oxygen-generating system, an ECG machine, medical suction equipment, and patient monitors. Plastic sealed bubble windows, an infrared system and an environmental control system also ensures a sterile environment. An external rescue hoist (patient litter lift) facilitates CASEVAC when the terrain or operating environment preclude



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Photo: US Army

**A combined forces squad transporting a sked with a wounded soldier to an HH-60M MEDEVAC BLACK HAWK helicopter in an exercise at Sventez-eris, Lithuania, 18 June 2016.**

landing. The HH-60M achieves a cruising speed of 150 kn. The unrefuelled radius of 275 nautical miles can be extended through use of an external fuel tank. The vertical rate of climb (at 7.600 kg weight) is 478 metres per minute, enabling a rapid departure from a battlefield landing zone.

#### FLRAA

The US Army and US Marine Corps (USMC) are setting high expectations in the Future Long Range Assault Aircraft FLRAA, which is expected to enter service in around 2030. The FLRAA will replace the Army's current UH-60 utility helicopter and the USMC's UH-1Y. The FLRAA programme

calls for a threshold cruising speed of 250 kn and an objective speed of 295 kn. The unrefuelled combat radius threshold is 200 nautical miles for the Army and 365 miles for the USMC, with objective range of 300 and 450 miles, respectively. Like its predecessors, the multimission FLRAA will perform CASEVAC among other duties. The improved performance parameters could cut CASEVAC response time in half or double the range for evacuating wounded soldiers within the "golden hour." Contenders for the FLRAA contract are the Bell V-280 VALOR tiltrotor and the tandem-rotor Sikorsky SB-1 DEFIANT. A Critical Design Review is scheduled for 2024.



Photo: Bell Helicopter

**Bell's V-280 VALOR is a contender for the Future Long Range Assault Aircraft (FLRAA) contract.**

#### HC/MC-130J

Where available, US Air Force (USAF) and USMC HERCULES transports and tankers can be called upon for ad-hoc CASEVAC. Although not as versatile as helicopters, the Lockheed Martin C-130 can land in unprepared terrain, and has a notably greater range (1,600-2,100 nautical miles) and speed (360 kn) than helicopters. Depending on the terrain, altitude and payload, the take-off roll can be as short as 953 metres. The HERCULES aircraft can also be equipped with MEDEVAC modules for planned evacuation of wounded, injured or ill personnel. The latest model to enter service (1999) is the C-130J SUPER HERCULES, which comes in two variants, with either a standard hull or with a stretched hull (C-130J-30). The standard C-130J can carry up to 72 litter patients; the C-130J-30 fits 97 litters. When equipped for MEDEVAC missions the aircraft's standard crew is augmented by five medical personnel (two flight nurses and three technicians). MEDEVAC missions can be conducted in-theatre or out-of-theatre.

#### C-17

The air-refuellable Boeing C-17 GLOBEMASTER has global reach, and is the aircraft of choice for long-range MEDEVAC missions. These wide-body strategic airlifters can be configured as flying intensive care units. It can simultaneously accommodate 54 ambulatory and 36 litter patients in addition to necessary medical equipment. Patients are accompanied by specialised critical care teams. In 2011, at the height of the ongoing conflicts, USAF C-17s were flying eight MEDEVAC missions weekly to transport stabilised US and allied/partner patients from the central regional hospital at Bagram Air Base in Iraq to the US Army Medical Centre at Landstuhl, Germany. From there some were airlifted further, to the US or other home countries.

### Europe

#### H145

Several European-made helicopters are deployed for CASEVAC/MEDEVAC missions, most often through the reconfiguration of multi-mission aircrafts. This includes the militarised version of the Airbus EUROCOPTER EC145 Light Utility Helicopter (LUH). This aircraft is also operated by the US Army, where it was introduced in 2007 under the designation UH-72 LAKOTA LUH. The majority of the LAKOTAs are permanently configured for medical transport and are officially designated as MEDEVAC aircraft bearing the Red Cross symbol. The aircraft



can accommodate two NATO standard litters in addition to one medical escort. The helicopter has a sprint speed of 145 kn and a cruising speed of 133 kn (268 kph), with a mission range of 370 nautical miles or 685 kilometres.

As the US Army considers the aircraft too light for combat theatre, the LAKOTA is deployed within US territory as well as under benign conditions overseas. Other users are less restrictive. The German armed forces, for example, use the special operations variant of the EC145 (under the designation H145M LUH). The mission profile includes combat search and rescue and CASEVAC flights. The SOF variant is suitable for covert CASEVAC in contested regions because of its reduced-visibility grey paint job and its acoustic-dampening shrouded tail rotor. The 11-metre diameter main rotor and 13 metre overall length makes the LUH suitable for urban CASEVAC as well.

#### A169

The Leonardo/Agusta Westland Next Generation Multirole helicopter, designated the AW169M, is another light-to-medium aircraft, which includes CASEVAC and MEDEVAC among its mission portfolio. The militarised version of the AW169 introduced in 2015, it features advanced avionics and a state-of-the-art digital cockpit which provides enhanced situational awareness as well as improved workload management under high-stress conditions. The AW169M achieves a cruising speed of 145 kn and a range of 440 nautical miles (820 kilometres). The 10-person cabin – the largest in its size class – can be converted to accommodate two litters plus attendant personnel. The external hoist and 1.6 metre-wide cabin doors facilitate loading the wounded, either on the ground or while hovering. The five-bladed rotor provides enhanced hover performance under adverse conditions including “hot and high” operational environments.

#### NH90

While the A169 is a new development still being evaluated by European armed forces, the Airbus NH90 introduced in 2007 is currently in service in 14 nations worldwide. Considerably heavier than Leonardo’s new aircraft, the NH90 Tactical Transport Helicopter (TTH) variant features a capacity of 12 litters when deployed in the CASEVAC/MEDEVAC role. Performance parameters include a top speed of 160 kn or 300 kph, an operational range of 800 kilometres and a rate-of-climb of eight metres per second. Germany, in particular, has favoured the deployment



Photo: US Air Force

**C-130s can deploy for CASEVAC as well as MEDEVAC. Here, a Special Operations Support Squadron physician practices medical care on a simulated patient during exercise Emerald Warrior/Trident at Naval Air Station North Island, California, US, 16 January 2019.**



Photo: US Army

**An HH-60M hoists up a flight medic and a simulated casualty at the Battle Area Complex on Hawaii, on 6 October 2016.**

of the NH90 in the forward air medical evacuation (FAME) role, including in Afghanistan and Mali.

Eurocopter first presented the FAME conversion kit at the 2010 international aviation exhibit (ILA) in Berlin in response to a German MoD initiative for protected evacuation of wounded personnel under combat conditions, from all terrains and under all environmental conditions. The kit can be installed within 30 minutes. Elements include two intensive care stations equipped with defibrillators, respiratory ventilators, diagnostic equipment such as ultrasound systems, heart monitors and blood-gas spectrometers. Additional ambulatory patients can be transported at the same time.

Patients are attended in flight by a physician and one or two medical technicians. Normal operating procedures call for one CASEVAC helicopter to be escorted by another, combat-ready NH-90.

#### C295

The bridge between CASEVAC helicopters and longer-range MEDEVAC aircraft are light-to-medium tactical aircrafts such as the Airbus/CASA C295M military transport. The newest variant is the C295W introduced in 2013. Compared to previous C295 versions, it comes with a more powerful PW127 turboprop engines and with winglets, which improve lift and manoeuvrability, especially in “high and hot”

terrain. The state-of-the-art avionics suite permits all-weather, day and night operations even in extreme environments. Operational range is 2,000 nautical miles. The self-defence suite for hostile operating zones includes radar-, missile- and laser warning systems as well as flare and chaff dispensers. In the CASEVAC/MEDEVAC

configuration the C295 can carry up to 24 litter patients plus seven medical attendants. An intensive care module with life support equipment can also be installed.

#### A400M

The Airbus A400M multirole transport aircraft can deploy for tactical and stra-

tegic airlift. The maximum range is 4,800 nautical miles (8,900 kilometres); the four turboprop engines provide a top speed of Mach 0.72. The large cargo hold can easily be configured for MEDEVAC missions. Eight stretchers are permanently stored onboard, enabling the plane to conduct ad hoc evacuation missions that might arise during its regular transport flights. However, the hold can accommodate up to 66 standard NATO stretchers arranged in triple-bunk formation on both sides of the plane. This leaves seating for 25 attending medical personnel on pre-planned MEDEVAC missions.

Since 2018, the Airbus A400M can also deploy in Intensive Care Aeromedical Evacuation (ICEA) configurations. The key is the ICEA module, which can be installed aboard the standard A400M transport aircraft. The German MoD has procured four ICEA modules. Each module can accommodate six patients, including two seriously wounded persons requiring intensive care, two patients requiring intermediate care, and two with lower-priority injuries. Depending on the number of patients and the severity of injuries, each intensive care airlifter is accompanied by a six- to 11-person medical team. The aircraft are ready to deploy on 12 hours notice. The air-refuellable A400M has a global reach, and can operate from unprepared grass or dirt landing fields without ground support. In most cases, the plane requires no more than 1,000 meters for take-off and landing. These characteristics make it suitable for direct CASEVAC missions in remote areas.

Photo: Leonardo



**The AW169M is being marketed to military and civilian government agencies.**



Photo: USAF photo

**A reserve critical care air transport team nurse comforts a wounded Canadian army soldier aboard a C-130 HERCULES during an emergency airlift from Kandahar Airfield, Afghanistan, 14 February 2010. Aero-medical Evacuation team members are considered as crew, meaning they must be familiar with the C-130 aircraft in addition to the medical specialty they practice. They need to know how to configure the aircraft to accommodate patient litters and how the electricity works for the machines used to keep patients safe in flight.**

#### A310

The wide-body A310 transport jet based on the civilian Airbus A310 can also be equipped with an intensive care module with a capacity for six patients. Litters are placed directly onto each patient bay to avoid additional trauma when transferring the wounded. Medical equipment integrated into to each patient bay is fed from the aircraft's electric grid, but each station also has a four-hour emergency battery as backup as well. A total of 38 standard litters can be transported in addition to the intensive care module. 16 of these 38 litters can be provided with intermediate-care-level monitors. Up to 25 medical personnel escort the patients. Configuring the A310 for MEDEVAC missions requires considerable restructuring of the passenger bay, including removal of internal dividers, overhead bulkheads, and seating. The work takes approximately one week, and is commonly performed on aircraft designated for pro-



longed standby MEDEVAC duties. Planes can be ready for take-off within three hours of receiving a mission order. The A310 has an 11.000 kilometre operational range and a cruising speed of 464 kn or 860 kph.

### A330 MRT

Many tanker aircraft perform double duty as transporters, and include a MEDEVAC capacity. This is true of the Airbus A330MRTT (Multi-Role Tanker Transport). In the "light MEDEVAC" role, up to 130 standard litters can be rapidly installed over folded down seating. This permits the plane to carry personnel into a theatre of operation, then immediately take on wounded to be evacuated to their home country or another safe nation. Alternatively, the plane can be pre-configured in advance for the "Intensive MEDEVAC" mission. This involves the installation of a six-patient intensive care module as well as carriage for an additional 28 stretchers and up to 20 medical staff. A third configuration option calls for 40 litters, 20 medical attendants, and 100 ambulatory or healthy passengers, but no intensive care unit. The MEDEVAC mission does not impair the plane's ability to perform the primary tanker mission.

### Unmanned CASEVAC

Over the past decade, there has been increasing interest in the potential of unmanned aerial systems (UAS) for the CASEVAC role. Benefits would be: no risk for human flight crews; some (but not all) UAS would be smaller than manned aircraft, making them less detectable and



Photo: Tactical Robotics.

**Demonstration flight of the CORMORANT UAV in May 2018.**

permitting landing in a smaller space; potentially faster response times as dispersed field units could keep their own smaller CASEVAC UAS on call.

### United States

In 2015, Lockheed Kaman Aerospace and Neya Systems jointly tested a collaborative CASEVAC using an unmanned ground vehicle to locate the wounded target, who was successfully evacuated by an unmanned K-MAX heavy-lift helicopter. The K-MAX was previously tested for battlefield logistic support from 2011-2014 in Afghanistan by the US Marine Corps.

The US Army's Telemedicine and Advanced Technology Research Center's (TATRC) is systematically pursuing research into unmanned aerial and ground systems to perform CASEVAC, MEDEVAC and medical logistics missions. TATRC repeated the CASEVAC experiment with Kaman in 2016; the interaction between the ground and aerial

platforms was controlled through the Vertical Take-off and Landing (VTOL) Evacuation and Resupply Tactical Interface, or VERTI. TATRC has also evaluated the DP-14 HAWK for CASEVAC suitability. Developed by DPI UAV Systems in Pennsylvania, the HAWK resembles a miniature CH-47 CHINOOK. The twin-rotor UAS can be transported in a van or other utility vehicle, and reaches a top speed of 105 kn and a cruise speed of 70 kn. The 180x50 centimetre cargo bay can fit one person lying prone. The service ceiling is 4,600 metres. The aircraft can hot start within five minutes or cold start – including flight plan input – within 15 minutes.

### Israel

Perhaps better known is the CORMORANT VTOL UAS (initially introduced under the designation AIRMULE) developed by Israel's Tactical Robotics. The first full-scale untethered autonomous flight was conducted in 2016. In May 2018, CORMORANT performed a mission representative CASEVAC demonstration for the Israeli military. The aircraft navigates via on board laser and radar altimeters, inertial sensors, and electro-optical sensors. The CORMORANT uses ducted fans rather than conventional rotors for lift. This enables a much smaller footprint than even a small helicopter. Including the ducted fans the aircraft measures 6.2x2.15 metres, making the UAS suitable for urban and wooded settings. In its CASEVAC role, the CORMORANT can carry two wounded internally. The CORMORANT is the first UAS certified by NATO for both cargo and CASEVAC missions. Tactical Robotics has been working closely with the Israeli Defense Forces (IDF) for nine years to refine the design and capabilities. If acquired by the IDF, the CORMORANT will be the first serial UAS to deploy (among other functions) in its CASEVAC role. It will certainly not be the last. ■



Photo: Airbus

**A Belgian army NH90 Tactical Transport Helicopter**



## Full Steam Ahead

Innovative processes and materials are key for the development of the next generation engines.

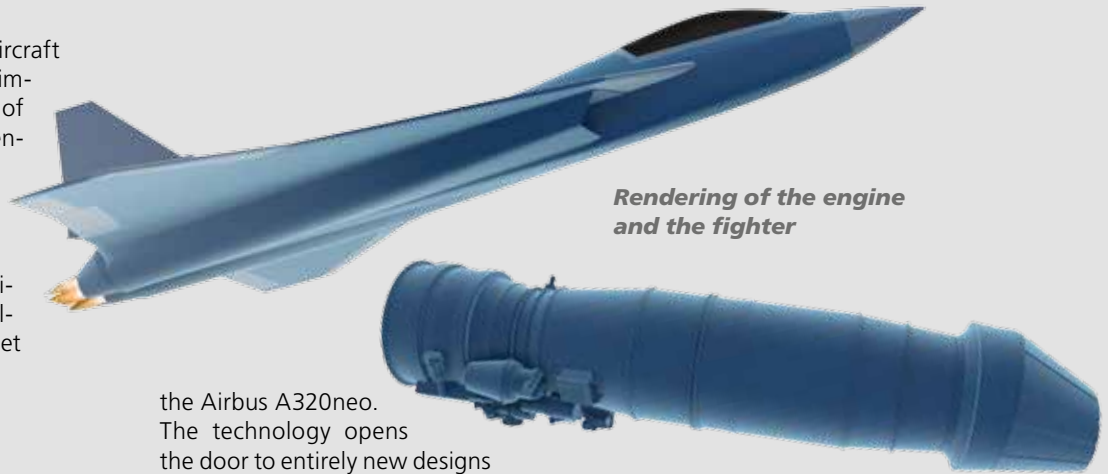
The next European fighter aircraft is expected to inject fresh impetus into the development of engine technologies. With entirely new concepts, such as 3D printing and the digital twin, MTU Aero Engines, Germany's leading engine manufacturer, is optimally prepared for the challenges ahead and ready to get down to work.

### 3D Printing

As one of the first companies in the world, MTU is producing engine components by 3D printing. MTU counts among the first companies worldwide to use the new technology, having made production parts by additive manufacturing since 2013: At its Munich location, the company produces bore-scope bosses for the engine powering

the Airbus A320neo. The technology opens the door to entirely new designs which will help satisfy the requirements for the Next European Fighter Engine (NEFE). In addition, 3D printing also appreciably cuts development, production and lead times, thus bringing down production costs overall. Estimates are that parts manufactured using additive techniques will account for up to 15 percent of the total parts count of

*Rendering of the engine and the fighter*



next-generation engines – including the NEFE – by the year 2030.

In the development of the NEFE, MTU is strongly relying on digital technology. Computer-aided simulation techniques have become an indispensable tool in the design of engines. The “virtual engine” allows the extent of costly and time-consuming testing of materials, parts, components and entire engines to be reduced. Iteration loops are faster, which cuts down on the experimental effort needed to achieve the required specification values. At the same time, the accuracy and quality of the results are improved. This method of virtual representation, which replaces the conventional processes used, for example, in the development of the EJ200, will open up entirely new possibilities for the NEFE right from the outset. The “virtual engine” platform permits simulations of the overall system, thus making sure that potential problems and conflicts of objectives are identified early on. This is particularly important given the high standards to be satisfied in development and production, but also in maintenance and service. Moreover, problem-solving requires markedly fewer iteration loops.

The company is also driving forward with the digital twin, which is a software representation of a real product (component, module, or engine) and contains all digitally available information about

Photos: MTU Aero Engines

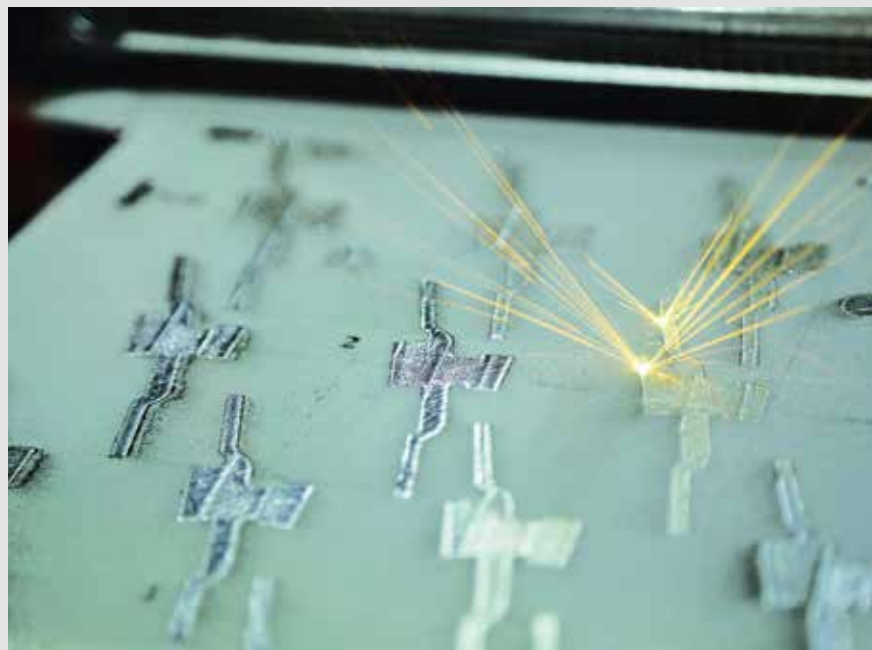


**Light, sturdy, temperature-resistant: ceramic matrix composites are ideally suited for engine construction. The new material could save weight, optimise combustion and increase efficiency.**

the entire lifecycle – from development and production through to the in-service phase. This way, the product can be optimised by engineering as regards its function, manufacturability and use, for example by comparisons with actual data from production and operation. MTU plans to step up its research efforts in this field over the next few years and build a virtual network that spans the entire value-adding chain. The findings and lessons learned in the process will then be directly infused in the development of the NEFE. This way, it is hoped to cut down significantly on development costs.

## Ceramic Composites

Apart from these innovative manufacturing and development processes, MTU is placing an increasingly strong focus also on new material classes. While fibre-reinforced composite materials are



**Process of additive manufacturing: Series production of boroscope eyes for the PW1100G-JM by selective laser melting (SLM)**

currently used for a few engine parts only, the advantages they afford make them attractive candidates for a much wider range of components. Among the materials that hold the greatest promise for future engine applications are ceramic matrix composites (CMC). Ce-

ramic matrix composites stand out over conventional materials. Unlike conventional ceramics, these composites are not brittle and are thus suitable for use in highly stressed structures, such as the low-pressure turbine. Despite the high mechanical and thermal loads to which CMCs are exposed in such applications, these materials require less cooling than metals. Moreover, components made from CMCs are much lighter than their conventional counterparts. The new material has the potential to lower weight and reduce the cooling air demand, thus increasing efficiency and mission flexibility.

## New Ideas Need Financial Support

Be it innovative manufacturing processes, such as 3D printing and the digital twin, or advanced fibre-reinforced composite materials: Without adequate financial backing for sustainable technology development it is not possible to fully exploit promising technology potentials in engine development. New ideas require strong financial support for sustained growth. This is one of the reasons why MTU today needs planning reliability through public funding commitments, which are necessary to ensure the operational readiness of the new weapon system as from 2040.



**Heat test: A part made from oxidic CMC is tested in an oven at 1,100 degrees Celsius in order to study the possible applications of the material under extreme conditions.**

# “PESCO was a major step.”

Photo: Fin MoD, Tiina Takala



## Interview with Raimo Jyväsjärvi, National Armaments Director at the Ministry of Defence of Finland

**Jyväsjärvi:** Finnish Defence Forces invest annually a reasonable amount from its procurement funds to military aerospace related R&D projects. Currently the main aerospace R&D priority areas include the overall development of current air combat capabilities, the HX fighter programme aims to replace the current fleet (64 fighters) of F/A-18 HORNETs, and emerging space technologies.

**ESD:** Which of these are carried out in international partnerships, and who are your partners?

**ESD:** What are your nation's current activities and considerations in the framework of PESCO (Permanent Structured Cooperation) and what are your plans?

**Jyväsjärvi:** The launching of PESCO was a major step. We expect PESCO to become a driving force for defence investment, capability development and operational readiness. It is a broad framework for defence cooperation, set to tighten along the years. For us, joining PESCO was an easy decision to take. The binding commitments of PESCO are the element that sets it apart from pre-

**ESD:** In many western countries, the changed security-political situation in Europe has induced governments to allocate additional funds for defence and armament. To what extent and in what way has this trend influenced things in your country?

**Jyväsjärvi:** This is indeed the situation also in Finland. Finland's military operating environment has changed. Military activity and military tensions have increased in the Baltic Sea region. That means that we are also allocating additional funds for defence to improve our readiness so that we are able to respond to the changes in the security environment. Because Finland never abandoned the national defence as one of the key priorities in our security policy, the defence fundamentals are already in good shape. Strategic capability programmes of the Navy and the Air Force (Squadron 2020 and HX) will be financed by additional resources during 2019-2031. During next decade our defence spending is coming close to 2% of the GDP.

**ESD:** What are the most important military aerospace programmes in your country, both current and forthcoming?

**Jyväsjärvi:** The most important one is the HX programme that aims to replace the existing F/A-18 HORNET fleet's capability. The procurement decision will be made in 2021.

**ESD:** What share of your procurement funds is invested in military aerospace R&D and what are you concentrating on?

Photo: MoD Finland



**A Finnish F/A-18 HORNET takes off from Rovaniemi Airbase during Exercise Trident Juncture 2018 on 25 October 2018. Finland wants to replace its F/A-18 HORNET fleet.**

**Jyväsjärvi:** Currently, Finnish Defence Forces actively participate in multilateral R&D cooperation, for example, within the framework of the European Defence Agency (EDA). Overall, international cooperation is an integral part of the Finnish Defence Force's R&D activities, and especially multilateral cooperation is becoming increasingly important along the development of the new funding mechanisms such as the EDF.

vious defence initiatives. Currently we participate in four PESCO projects and are observers in six projects. We are currently assessing new possible projects. Military Mobility is a good example of a PESCO project that can support our defence capabilities and help protect the Union and its citizens.

**The questions were asked by  
Peter Bossdorf**



# UAS for Reconnaissance and Surveillance

**Sidney E. Dean**

**Unmanned Aerial Systems (UAS) – which consist of an Unmanned Aerial Vehicle (UAV) plus sensors, command & control, and launch elements – have become indispensable assets for military Intelligence, Reconnaissance and Surveillance (ISR) missions.**

While different nations have different classification systems, UAS are generally categorised according to their size and performance parameters, whereby large UAV naturally feature higher endurance, operating altitude and payload than smaller aircraft. They can additionally be classified as either fixed-wing, rotary or tiltrotor aircraft. While some UAS are generalists, many are tailored to very specific mission profiles. Performance parameters in general are improving through ongoing developments in the fields of Artificial Intelligence (AI), Command, Control and Communications (C3), battery capacity, motor efficiency, and sensors.

## HALE/MALE

The largest and most powerful UAS are categorised as High-Altitude/Long-Endurance (HALE) and Medium Altitude/Long-Endurance (MALE), respectively. Because of their size, HALE and MALE UAV normally operate like manned aircraft from a standard land-based runway. NATO classifies UAS with a service ceiling above circa 14,000 metres as HALE. These systems are considered strategic or national assets, which operationally support theatre commanders. NATO classifies MALE UAS as those flying between 5,500 and 14,000 metres altitude, in support of Joint Task Force commanders on theatre-level missions.

## RQ-4 Global Hawk

The largest and most powerful UAS in US production belong to the Northrop Grumman RQ-4/MQ-4 family. The original RQ-4

GLOBAL HAWK HALE entered service provisionally after the September 11 2001 terrorist attacks. Beginning in November 2011, GLOBAL HAWK prototypes performed US Air Force reconnaissance missions over Afghanistan in support of coalition intelligence gathering and mission planning.

Considered a next-generation technology, the AN/ZPY-2 provides highly detailed sensor imagery of moving targets.

The RQ-4 is 14.5 metres long, with a wingspan of 39.9 metres. The gross take off weight is 14,628 kg, including a payload of 1,360 kg. The surface ceiling is 18,300 me-

Photo: USMC



**A Marine launches a PUMA UAV by hand in Afghanistan.**

Several models are currently operational. The Block 30 variant entered service in 2011. It is equipped with the Enhanced Integrated Sensor Suite, which simultaneously carries high-resolution electro-optical and infrared sensors and an all-weather synthetic aperture radar/ground moving target indicator (SAR/GMTI). The UAV also carries an Airborne Signals Intelligence Payload (ASIP) with high and low band signals intelligence (SIGINT) sensors. Multiple sensors can be used simultaneously.

The Block 40 variant was added to the US Air Force inventory in 2013. It carries the AN/ZPY-2 Multi-Platform Radar Technology Insertion Programme (MP-RTIP) active electronically scanned array (AESA) radar, which provides both SAR and GMTI data.

The jet-powered aircraft self-relocates to the operational theatre, and has a ferry range of 12,300 nautical miles. Maximum flight endurance exceeds 32 hours, with 24 hours loiter time over the target area (calculated on a 1,200 nautical mile distance between the airbase and the target area). Typical loitering airspeed is 310 kn.

The high surface ceiling, long-range and powerful sensor suite enables the RQ-4 to simultaneously provide both wide area coverage and detailed ISR in near real time. Sensor data is relayed in near real time through wideband Ku SatCom and alternately through line-of-sight communications. The RQ-4 is remotely operated in flight by a two-person crew (pilot and sensor operator). An additional pilot stationed at the forward op-

## Author

**Sidney E. Dean** is President of Transatlantic Euro-American Multimedia LLC. and a regular contributor to ESD.



**The BLACK HORNET Nano UAS has been fielded or tested by over 30 nations since 2011.**

erating airbase controls the UAV for take off and landing. The RQ-4 has been acquired by NATO as a joint asset. Japan and South Korea are also acquiring the UAS.

### MQ-4C TRITON

A maritime variant, the MQ-4 TRITON, achieved Initial Operational Capability (IOC) with the US Navy in 2018. Full Operational Capability (FOC) is planned for 2023. The RQ-4C will perform persistent wide-area maritime ISR, freeing up manned aircraft for more targeted missions. It will also work in tandem with manned aircraft, locating and identifying targets to be attacked. The onboard Automatic Identification System (AIS) enables the UAS to autonomously identify vessels by class without human intervention. Flight parameters are largely equivalent to the RQ-4, with the exception that the MQ-4 is capable of rapidly dropping from high to low altitude to focus electro-optical sensors and a laser range-finder and target designator on an acquired vessel. The sensor suite is optimised for the marine environment and mission. It includes AN/ZPY-3 AESA radar capable of operating in inverse SAR (ISAR) mode. The AN/ZPY-3 can survey a 5,200 square

kilometre swath during one sweep, or a seven million square kilometre area over the course of a 24-hour mission. The MQ-4C is being acquired by Australia and by Germany. The German UAS are expected to field a sensor suite developed by Airbus.

### EuroMALE

Airbus is leading a joint effort including Dassault and Leonardo to field a MALE Remotely Piloted Aircraft System (RPAS) by circa 2025. Frequently referred to as the EuroMALE, the UAS will be powered by two six-bladed turboprop engines and have an estimated operational range of 750 kilometres or 405 nautical miles. The surface ceiling is expected to be in the 7,500 metre range. The ten-metre long aircraft will have a wingspan of 15 metres and gross take off weight of 1,100 kg.

Airbus revealed a full-scale model at the Berlin Air Show in April 2018, although the company cautions that this may not fully reflect the final design. The system preliminary design review – a major milestone in the ongoing development – was achieved in November 2018. The design review followed the October 2018 invitation by the European Organisation for Joint Armament

Co-operation (OCCAR) for Airbus Defence and Space to submit a tender for the development, production and the initial in-service support phase of the European MALE RPAS Programme. As reported by Airbus, the preliminary design review will allow the participating states – France, Germany, Italy and Spain – and industry to start developing the system with aligned requirements and a clear picture of the overall system design. Capacity goals include flight operations in non-segregated airspace, payload modularity, and capability to operate worldwide. The mission profile encompasses Intelligence, Surveillance, Target Acquisition and Reconnaissance (ISTAR) missions.

### PATROLLER

Another European-designed MALE UAS – Safran's PATROLLER – is currently entering service with the French army's reconnaissance forces. It is equipped with the EuroFLIR 410 optronics suite, an imaging radar, and a SIGINT suite. It is suitable for a wide range of ISR missions, including target acquisition and designation. A maritime variant is also offered. The PATROLLER can carry a 250 kg sensor payload on missions exceeding 20 hours duration. The service ceiling is 6,000 metres. The reinforced retractable landing gear permits operations from short runways. The UAS has a lower than average noise, heat and radar signature. The 8.5-metre long aircraft has an 18-metre wingspan and a range of 4,000 kilometres.

### HERON

Israeli industry globally markets several MALE UAS, including the IAI HERON, Elbit HERMES 900 and 1500, and Aeronautics Defence DOMINATOR XP. The HERON is the most mature of the three, entering service with the Israeli Defense Force in 2007. An additional nine nations, including five NATO members, now operate the HERON. Several variants are available, including the extended-range HERON TP with an endurance of more than 30 hours and a service ceiling of 13,850 metres. The 14-metre long plane has a wingspan of 26 metres and is powered by a single turboprop engine. The maximum take off weight of 5,670 kg includes a maximum payload of 2,700 kg. The payload configuration is modular and can be adapted to client and mission requirements. The aircraft control and Automatic Takeoff and Landing (ATOL) systems has been refined to permit remote operation in several thousand kilometres distant from the main base of operations. This includes the



**Originally designed by EADS/Casa, the ATLANTIC UAS made its maiden flight in Spain in 2013.**



**SCHIEBEL**



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**Unveiling of the EuroMALE model at the 2018 Berlin Airshow: One of the characteristics of this UAS will be modularity for intelligence, surveillance and reconnaissance missions, both wide-area and in-theatre.**



**The DOMINATOR XP carries a wide range of ISR sensors.**



**The PATROLLER UAS is currently entering service with the French Army's reconnaissance forces.**

capability of landing and take off from remote sites with minimal infrastructure, coordinated from the main base via satellite communication. This eliminates the need for a ground control station and flight crew to be located at the aircraft's forward base. A small team with basic refuelling infrastructure will suffice in the theatre of operations.

### HERMES 900/1500

Elbit markets a complete family of tactical UAVs under the HERMES line. The two most powerful are the HERMES 900 and HERMES 1500. The single-engine 900 has a 15-metre wingspan and 300 kg payload capacity. Payload options include electro-optics, IR imaging laser range finder and

laser designation, as well as SAR/GMTI, COMINT DF, ELINT and electronic warfare. The ATOL permits remote operations from non-instrumented runways. A single operator controls both the aircraft and sensors. Control and communications options include Beyond-Line-Of-Sight (BLOS) through SATCOM, and Line-of-Sight (LOS) through datalink. Mission endurance can extend to 36 hours, with a surface ceiling of 9,200 metres. The UAS can be deployed for missions over land or sea. It has been acquired by seven nations plus the European Maritime Safety Agency.

The larger HERMES 1500 is powered by two turboprop engines. It achieves a surface ceiling of 10,150 metres and carries a 400 kg payload. At 24+ hours, mission endurance is lower than the 900 variant. Mission control is through the same Universal Ground Control Station as other HERMES utilised for other HERMES variants.

### DOMINATOR XP

Unlike the other MALE UAS discussed here, Aeronautics Defense's DOMINATOR XP is based on a manned aircraft, the Austrian DIAMOND DA42 Twin Star. While the UAS retains the manned aircraft's avionics and general performance profile, it features improved fuel economy and consequently a higher mission endurance of 20 hours. The 373 kg ISR payload capacity permits carriage of multiple sensors, including electro-optical and infrared cameras (EO/IR), hyper-spectral sensors, laser designators, maritime radar for ISR in support of anti-submarine warfare and surface warfare missions, as well as for domestic security applications. The maritime radar includes SAR/ISAR modes. The maritime surveillance suite also includes search & rescue transponder detection and a ship Automatic Identification System (ASI) receiver. To date, the XP has been acquired by Mexico and by an as yet unnamed Asian client.

### Medium UAS

Medium sized/medium endurance tactical UAS typically support operational units at the brigade level, as well as serving as ship-board ISR systems. Service ceilings extend to circa 5,500 metres. Wingspan tends toward the 5-to-10-metre range, with a maximum gross take off weight around 600 kg. Endurance varies significantly among the systems, from several hours to more than 20 hours. Some medium UAVs take off and land conventionally, including on unprepared fields. Others utilise rail or catapult-assisted take off, and are recovered either by parachute or through arresting wires/nets.

# 5<sup>th</sup> Generation UAS Multi-Layered Mission Control Station

IAI is fielding the 5th generation of its UAS control station. The iUCS, a game changing new 4D Innovative Unified Control System (iUCS™), is the latest in UAS control, built to meet the multi-sensor, high-definition, multi-layered complex missions challenge to be responded to with the HERON family,

based on the extensive experience gained through over 40 years of UAS operations with more than 50 world-wide customers and over 1.7M flight hours, continuous evolution addressing user requirements and operational experience. Utilising a compact, modular design iUCS is operable as a stand-

alone unit, location pointing and system interface, enabling the controller to input changes in the flight plan, employ procedures, route management, altitude changes, communications control, etc. Special attention was given to reducing operator workload under routine operation



Photos: IAI

but not only... It brings refreshing and patent protected automation, planning, control, simulation, ergonomic & modular design to support multi-tasking easily performed by a single operator.

The challenges in 2020s missions have extremely increased with the development of new technologies (high-definition EO/IR/ LD, SAR, MPR, GMTI, ESM, COMMINT, ELINT ...), bringing new demands to link to external C<sup>2</sup> and C<sup>4</sup>I networking while using more and more unmanned solutions.

The iUCS is part of a solution that offers a powerful machine with maximum automation, advanced tools for mission editing and planning, automated flight, remote automated taxi, take-off and landing and latest mission operational tools. It provides synergy for the information gathered from all sources combined for a better battlefield situational picture and supports decision making.

The iUCS and HERON family provide a whole new level of complex missions handling, such as: ISTAR, maritime patrol, aerial persistence, border patrol, HLS, disaster relief, time critical situations and many more. iUCS reflects extensive investments in ergonomics and man-machine engineering,

alone unit in a vehicle, or with multiple consoles grouped in a mobile (land or sea) shelter or fixed location.

Where several mission controllers simultaneously operate multiple-sensors on a single UAS, iUCS can also operate in large groups, supporting multi-UAS operations centre (MOIC - Mission Operation and Intelligence Center).

iUCS panoramic multi-screen view comprises two 32"/24" (space depended) high-resolution display screens locating the operator in the centre, providing ample viewing area for simultaneous mission planning and control, with simultaneous live sensor feeds and access to local or remote information sources online.

The iUCS operation implements a fighter pilot 'Hands on Stick and Throttle' concept, patent protected, for a user centric operation, using the joystick and the touch screen to maintain directional control of the payload. An ergonomic 'throttle' type multiple controls module is operated by the one hand, controlling various aircraft systems and payload functionality. A retractable tablet-shaped touch-sensitive display provides the main interface for mission planning

and in emergency. Voice commands are part of the user-machine interface, as the system understands spoken instructions, repeating the command and requests user approval before carrying out the command. Handling alerts is another way for the system reducing workload. Audio warnings are triggered in addition to visual alerts when required (weather warning, limitations crossing or when approaching restricted areas, are indicated visually and verbally, drawing the operator attention to the problem by double checking appropriate action).

The entire system uses Commercial off the Shelf (COTS) hardware, and implements an open and modular architecture that allows both hardware and software to be portable, scalable and upgradeable, supporting international standard including all relevant NATO standards including STANAG 4545, 4586, 4607, 4609, 4668, 4669, 4671 and 7023. The system operates with multiple servers, dual redundant database and RAID storage for redundancy.

The iUCS is the latest control station designed to get the best out of your missions with less manpower and shorter qualification time.

## RQ-21A

While the Boeing Insitu RQ-21A BLACKJACK is sometimes referred to as a small UAV based on its size (length: 2.5 metres; wingspan: 4.9 metres), take off weight (61 kg), and range (102 kilometres), its service ceiling (5,900 metres) and endurance (16 hours) places it in the medium UAS category ('Tier III' according to the US classification system). In service since 2014 with the US Marine Corps (and subsequently purchased by several NA-

TO partners), the BLACKJACK can operate from land or ship deck. Six payload spaces permit customising the sensor suite, which can include full-motion, day and night EO/IR camera systems, a laser rangefinder and an AIS receiver. The RQ-21 is launched from a vehicle-towed rail catapult and recovered in flight through an arresting wire. In May 2019, the USMC announced its intention to develop a vertical launch capability for the RQ-21 to reduce the logistical footprint and shorten launch and recovery time.

### CAMCOPTER - From the Arctic to the Desert

Schiebel's CAMCOPTER is among the best-known, widely used and field-proven UAV for naval and other applications. More than 60 UAV systems of this kind have been in service in the United Arab Emirates since 2017. In addition to Jordan, Libya, Australia and the USA, China is among the countries that successfully deploy the drone. Italy already deployed it in the scope of ATALANTA. The OSCE used it in Ukraine, to name just a few of the users and areas of application. In addition, there are countless civil missions and customers, for example in the energy sector, to control oil or gas platforms in deserts as well as in the oceans.

Photo: Schiebel



There is no other rotor UAS that has been tried and tested to the extent of the CAMCOPTER, recent Arctic tests included. Under the "Arctic 2030" project Norway's Andøya test centre selected Schiebel's CAMCOPTER S-100 Vertical Takeoff and Landing (VTOL) Unmanned Air System (UAS) for extensive search and rescue trials. The CAMCOPTER provided proof of its ability to perform in the harshest weather conditions and to operate at temperatures down to -40°C. This was successfully proven in a series of intense trials such as Canadian icebreaker operations. In this particular case, the CAMCOPTER was deployed 60 nautical miles north of Fogo Island, providing a wide-view image of the ice structure as well as identifying the boundaries between flat and rough ice.

Due to its long service life and global users, the CAMCOPTER has already undergone several improvements. With the help of the local positioning system "DeckFinder", take-offs and landings of the unmanned system without GPS were successfully executed. Schiebel has also successfully demonstrated the heavy fuel variant of the CAMCOPTER S-100 to the Royal Australian Navy. In addition, various payload options have been integrated over the years. The CAMCOPTER is thus not only the UAS of this class with the largest – also in terms of climatic conditions – operational area, but also with most of the options for the users, who can now configure the CAMCOPTER in response to their operational objectives, taking advantage from a large portfolio of equipment elements.

## WATCHKEEPER

The UK's WATCHKEEPER is the largest ongoing UAS procurement programme in Europe, with a minimum of 45 units delivered in 2018. The UAS is based on the Elbit HERMES 450 and is produced by a joint venture between Thales UK and Elbit. The primary difference is the payload capacity. In addition to the EO/IR sensors of the HERMES 450, the WATCHKEEPER also carries a dual-mode SAR/GMTI radar. Each sensor is on a separate 38 centimetre gimbal. The 6.1 metre long UAV has a 10.6 metre wingspan and a gross take off weight of 500 kg. The payload capacity is 150 kg. Mission endurance is 16 hours per aircraft, with a range of 200 kilometres for LOS control and data transfer. The UAS is designed to operate in extreme zones, including the arctic and desert. The UK army deployed WATCHKEEPER extensively in Afghanistan in 2014 with full operational capability achieved in 2018.

## ATLANTE

The Airbus ATLANTE is 5.47-metre long, with an eight-metre wingspan and a gross takeoff weight of 570 kg. Payload capacity is 100 kg. Payload options include a retractable EO/IR turret, SAR/GMTI radar, and maritime search radar. Mission endurance exceeds 10 hours, with a service ceiling of 6,000 metres and an operational range of 200 kilometres. The aircraft can operate at temperatures between minus 26 and plus 44 degrees Celsius, and can withstand crosswinds of 20 knots. Anti-icing and lightning protection systems contribute to the all-weather capabilities. Two options for take off and landing are available: Short take off (catapult launch and subsequent recovery by parachute); and Long Endurance (automated take off and landing using prepared or unprepared fields). A single operator console can control two UAS simultaneously. The UAS can act as data relays for one another, improving operational range and mitigating terrain impact on communications.

## SKELDAR V-200

Medium UAS include rotary aircraft. Their reduced footprint and vertical flight characteristics make unmanned helicopters particularly attractive as shipboard ISR elements. The SKELDAR V-200 – a joint venture between SAAB and the Swiss firm UMS Aero – is being acquired by the German Navy and by the European Maritime Security Agency, and is on offer to several other navies. The system is 4586 STANAG



compliant, and can be operated from all classes of vessel. The onboard footprint is minimal (fuselage length: four metres; rotor diameter: 4.6 metres; takeoff weight: 235 kg). The V-200 is the only UAV in its class that utilises heavy-fuel, thereby reducing logistical requirements. The system is controlled through an onboard single-operator console. Alternatively, the entire reconnaissance flight can be conducted in autonomous mode. Take off and landing are always autonomous.

The aircraft has a five-hour mission endurance. Sensor data is relayed through LOS datalink with a maximum 200 kilometre range. Payload capacity is 40 kg. Payload options include EO/IR, hyper-spectral and multi-spectral cameras, SAR, GMTI, AIS receiver, LIDAR (Laser Identification and Ranging) and ViDAR (Visual Detection and Ranging). SAAB describes ViDAR as "the world's first optical radar", which combines wide-area maritime search with high-resolution imaging of surface objects. Mission profiles include reconnaissance, identification of vessels, and targeting guidance for indirect fires. While currently marketed primarily as a maritime system, the SKELDAR V-200 can operate on land as well, requiring no infrastructure.

Photo: US Air Force



**An RQ-4 GLOBAL HAWK taxis on the flightline after an inspection at an undisclosed location in Southwest Asia, 18 September 2015.**

### Small UAS

The Small UAS categories display significant variations depending on the classifying agency. NATO defines aircraft weighing between 15 and 150 kg, with a surface ceiling of circa 1,500 metres and a range of circa 50 kilometres, as Small UAS. Systems weighing less than 15 kg are labelled as Mini UAS, with a service ceiling below 920 metres and a range of 25 kilometres. They operate at the company level and below, and are deployed by hand. Extremely small Micro UAS deployed at the platoon and squad level have a ceiling of circa 60 metres and a five kilometre range. By contrast, the US DoD's Group 2 category –

the equivalent of 'Small UAS' – includes systems weighing between 9.5 and 25 kg and with a ceiling below circa 1,080 metres. Group 1, encompassing both Mini- and Micro-UAS, includes systems weighing less than nine kilogrammes and with a ceiling 370 metres.

### RQ-20

The AeroVironment RQ-20 PUMA is one of the most successful small UAS. Since becoming operational with the US Special Operations Command in 2008, well over 1,000 units have been sold. All US services utilise the RQ-20, as do several partner countries. The US Army is the largest single

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user. Each infantry company is issued one PUMA UAS and an additional 18 are allocated to each brigade.

The aircraft is 1.4 metres long, with a 2.8 metre wingspan and a weight of 6.8 kg. The surface ceiling is 152 metres, with 2.5 hours flight endurance. The RQ-20's primary payload is the i45 gimballed sensor suite with dual 15mp EO cameras, 50x zoom, IR camera, low light camera for night-time missions, and a high-power illuminator. AeroVironment also provides users with Pocket Digital Data Link (pDDL AE) transceivers and Pocket RVT receivers for mobile real time reception of video and geodata collected by the UAS.

The newest iteration is the RQ-20 PUMA 3, introduced in March 2018. The upgraded UAS reflects client feedback concerning improved ability for integration of third-party payload elements. The PUMA 3 is also more resistant to radio-frequency interference than the previous versions. Other improvements include: the ability to concurrently operate the i45 gimballed sensor suite and signals intelligence (SIGINT) payloads; the latest Digital Data Link (DDL) offering M1/M2/M5 and M3/M4/M6 frequency bands and AES-256 encryption; enhanced portability (the complete system of three air vehicles and two ground control stations is now transportable in four portable cases rather than six cases).

In April, AeroVironment announced another payload upgrade with the availability of a new 360 Multi-Sector Antenna (MSA) for maritime ISR missions. Equipped with 24 high-gain auto-selective antennas covering 360 degrees, the MSA analyses downlink data quality and automatically broadcasts through the antenna patches, which are



Photo: UMS Skeldar.

**Germany is acquiring the SKELDAR V-200 for deployment on the FoC of the K130 class corvettes to undergo field tests.**

most favourably aligned with the controller. The standard line-of-sight communications range is 20 kilometres over land or sea. In 2017, AeroVironment introduced a Long-Range Tracking Antenna (LRTA) which extends the LOS range to 60 kilometres for land operations.

### MIKADO

The MIKADO (Mikro-Aufklärungsdrohne für den Ortsbereich – Micro-Reconnaissance Drone for Local Operations) micro-UAS is built by the German company Air-Robot. It is deployed by the German army at the platoon and squad level for offensive and defensive reconnaissance. The quadcopter has a one-metre diameter including the rotors and engines, and weighs 1.3 kg. The complete system's height is 24 centimetres, including the sensor gimbal. The micro-gimbal mounted 200 gram payload includes day and low-light cameras, IR, and

a laser target designator. Maximum altitude is 30 metres. MIKADO has a 20-minute endurance and a range up to 1,000 metres. The backpack-portable UAS is ready to fly in five minutes, and is controlled through a handheld tablet-sized console. The 'come-home' feature enables the UAS to return to its point of origin if the control signal is lost. Small size, vertical flight, and quiet, gearless electric motors make the MIKADO suitable for urban terrain and other cluttered environments.

### BLACK HORNET NANO

At the very end of the scale, is the pocket-sized BLACK HORNET Nano UAS developed by Norwegian firm Prox Dynamics (now a subsidiary of US-based FLIR Systems). The original BLACK HORNET entered serial production in 2012, and has been fielded by military and security forces of 30 countries. It was widely employed by UK forces in Afghanistan, and remains the world's smallest combat proven UAS. In 2018, FLIR introduced the upgraded BLACK HORNET 3 Personal Reconnaissance System (PRS). The nano-UAS weighs 32 grammes, and has an improved range of two kilometres. Flight speed is 21 kph. The BLACK HORNET is suitable for indoor and outdoor reconnaissance. The new variant can operate in GPS-denied areas. It retains the three-camera arrangement set into the helicopter nose, but adds sharper imaging processing capabilities with the FLIR Lepton thermal microcamera core and a visible sensor, which enhances image fidelity. An improved encrypted digital datalink ensures seamless communications and imagery beyond line-of-sight and in closed areas. The UAS can be integrated into the Android Tactical Assault Kit (ATAK), an application to form ad hoc battlefield data networks using smartphones.

Photo: German MoD



**UAS of the HERON family are used by defence and security agencies of ten nations. This includes the German armed forces, which are replacing their leased HERON 1 with the newer and more powerful HERON TP. While primarily equipped for ISR, the HERON TP can be optionally armed.**



# “Greece spends more than 2% on defence.”



Photo: MoD Greece

## Interview with Vice Admiral H.N. (Rtd) Kyriakos Kyriakidis, National Armaments Director at the Ministry of Defence of Greece

agreements are in effect and in full progress such as F-16 and P-3 upgrade programmes.

**ESD:** What share of your procurement funds is invested in military aerospace R&D and what are you concentrating on?

**Vice Admiral Kyriakidis:** In Greece, the total share of expenditure allocated to defence Research & Development (R&D), including aerospace R&D activities, reaches the 1% of total annual defence spending.

**ESD:** In many western countries, the changed security-political situation in Europe has induced governments to allocate additional funds for defence and armament. To what extent and in what way has this trend influenced things in your country?

**Vice Admiral Kyriakidis:** It is true that in recent years, the security environment has become unpredictable and fluid, with challenges and threats emanating from all directions, forcing many nations to increase the allocated national budget for defence and armaments.

However, this trend has not actually affected our country's policy on defence spending. It is well known that Greece, despite the economic challenges that it faces, continues to be one of the few countries that constantly spend more than 2% of its GDP to defence and is planning to do so in the future.

**ESD:** What are the most important military aerospace programmes in your country, both current and forthcoming?

**Vice Admiral Kyriakidis:** The Hellenic Ministry of National Defence is fully committed to take national defence capabilities to the next level. Given the security and financial situation along with the operational requirements, we are currently focusing on contracts and agreements for “Follow-on” support of already operational military equipment and systems. Nowadays, great effort is also focused on two major tendering procedures for follow-on support of the fleets of M2000/-5 and SUPER PUMA helicopters. Additionally major G2G

**ESD:** Which of these are carried out in international partnerships, and who are your partners?

**Vice Admiral Kyriakidis:** At this stage, international partnerships and collaborative R&D projects are mainly elaborated through European Defence Agency (EDA) ad hoc programmes, while preparatory actions are under development for exploiting the European Defence Fund (EDF).

**ESD:** What are your nation's current activities and considerations in the framework of PESCO (Permanent Structured Cooperation) and what are your plans?

**Vice Admiral Kyriakidis:** PESCO established a permanent framework for defence cooperation, among those member states

willing and able to jointly develop defence capabilities and invest in shared projects. Greece, a European country with strong Armed Forces, participates and actively supports PESCO in order to address current shortfalls on military capabilities and support EU missions and operations.

In that context, Greece believes that the cooperation and the harmonisation of the requirements and capabilities of the member states will allow the more efficient use of available defence resources in European level. Taking into account the binding commitments of PESCO, Greece has elaborated a National Implementation Plan (NIP), to implement these commitments and recently the NIP has been reported.

According to the binding commitments, Greece has made available deployable formations for the realisation at the EU Level of Ambition, while at the same time, it participates in 18 out of the 34 first and second wave projects (5 as coordinator, 9 as full member and 4 as observer). Regarding the future national projects, all relevant factors will be considered on a case by case basis.

**The questions were asked by Peter Bossdorf**

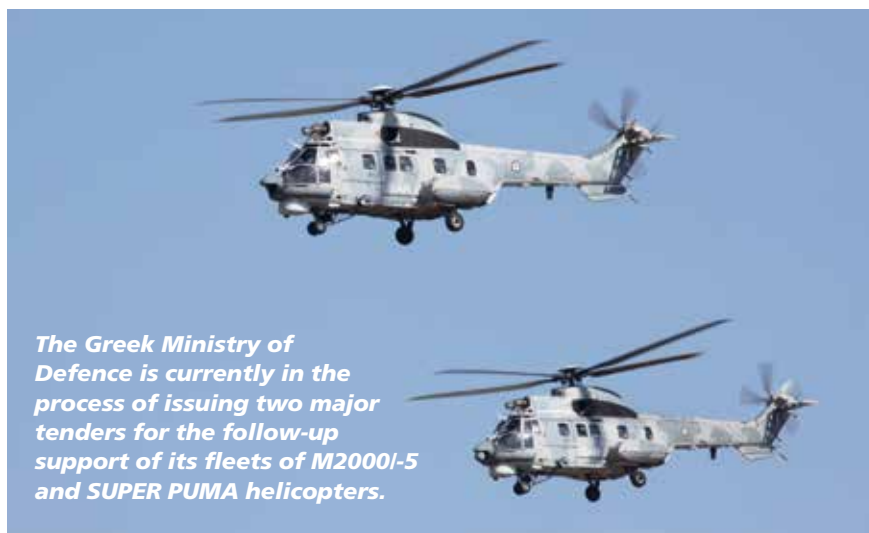


Photo: MoD Greece

*The Greek Ministry of Defence is currently in the process of issuing two major tenders for the follow-up support of its fleets of M2000I-5 and SUPER PUMA helicopters.*



# CHINOOK or KING STALLION?

## Heavy Lift Helicopter Alternatives for Europe

**Georg Mader**

Platforms to fulfil the heaviest load-carrying demands can be counted on one hand. When not counting the medium category of an AW/EH-101 or NH-90 below 15 tonnes MTOW, there are just two or three Western types, plus one upcoming Eastern type. In light of the ongoing tender for the German Bundeswehr's heavy-lift helicopter requirement, this article takes a further look at who is really lifting out there.

Finally, the German government has taken another step forward to replace its ageing fleet of CH-53 heavy transport helicopters. On 28 February 2019, the German procurement authority BAfNBw published the performance and programme details for

of the tender documents. A request for proposals (RFP) will be issued shortly, followed by a type selection in 2020 and aircraft deliveries from 2023 onwards. The helicopters will be based in Schönewalde/Holzsdorf near Berlin and Laupheim near Ulm.

Referring to the RFP, Frank Crisafulli, Business Development Manager for heavy-lift helicopters at Sikorsky, said that the delay of the 2019 defence budget approval by the Bundestag budget committee (earlier in the same month) should have no real knock-on effect on the timeline for the STH programme for the Luftwaffe: "We are very happy about the approval after all the budget drama. The Germans have compressed the timeline but the planned delivery dates remain the same. They are looking for between 45 and 60 helicopters from late 2023 or very early 2024." German Luftwaffe Chief of Staff LtGen Ingo Gerhartz has also welcomed the budget allocation for the new helicopter: "This will help to advance the urgently needed modernisation of the air force."

### Secure for the Moment

In the end, procurement will be dependent on the budget plan of the Social Democratic Finance Minister Olaf Scholz who is calling for a German defence budget of 1.23 % of GDP by 2023. That is about €3.3Bn and clearly undercuts Berlin's pledge to spend 1.5 % on the military by 2024, and is much less than the €28.2Bn demanded by Defence Minister Ursula von der Leyen for the next four years. Subsequently, there were some discussions about postponing or scrapping major procurement programmes, such as the submarine to be developed jointly with Norway by TKMS and Kongsberg, the new multi-role MKS 180 warship, the new MEADS missile-defence system by Lockheed Martin and MBDA, or the new heavy lift helicopter we are discussing here.

However, in March 2019, a German Finance Ministry document, which has since been approved by the Cabinet, singled out the STH as "the only major arms programme on a list of mandatory elements". This means that – at the mo-

Photo: Boeing



**Boeing's CH-47F CHINOOK is a contender for Germany's heavy lift helicopter programme.**

the Schwerer Transporthubschrauber (STH) requirement. They want to procure 44 to 60 heavy helicopters for the Luftwaffe over an eight-year delivery period. After approving the budget of up to €5.6Bn for the STH programme in November 2018, the German government remarked that the Boeing CH-47F CHINOOK and Sikorsky's CH-53K KING STALLION would "appear to be appropriate" to replace the 70 incumbent Sikorsky CH-53G/GS/GA/GEs. The (two) interested parties responded by 14 May to the release

According to the tender documents, the future helicopter should be capable of transporting personnel and equipment/vehicles and have a maximum take-off weight (MTOW) of 20+ tonnes. With such a load, the helicopter has to achieve a minimum speed of 120 KTAS (~220 km/h) at International Standard Atmosphere. With regard to the lifting capability requirements, the tender specifies 30 soldiers with equipment of 115 kg each, or 10 tonnes of cargo either stored internally or underslung externally. Another "must" is the transport of eight tonnes of internal cargo over a distance of 230 km. Winch sets, ballistic protection, an Elop/IR sensor and self-defence arrangements are also listed. Procurement includes mission systems, logistics and operational support, including the necessary equipment as well as technical and flight training.

### Author

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

ment – hopes for the project look fairly good, so we can indeed expect a "real" RFP sometime this year.

## No Heavy Lifter from Europe

During the discussion on the STH programme, the Federal Government stated that a "new helicopter to be developed" was out of the question. This statement refers to an aborted plan to develop a truly European "Heavy Transport Helicopter (HTH)" and a lighter FTH "Future Transport Helicopter". Back in 2003, the German Army Aviation Corps (Heeresflieger) and the French General Delegation for Ordnance (DGA) laid down the basic requirements for a new heavy transport helicopter to replace the German CH-53G/GSs and older CH-47s in Europe. Germany was to procure between 60 and 120 helicopters, with France being another prospective customer. In 2004, it became clear that there were no funds for development until 2015. In February 2006, the German procurement authority nevertheless began discussing the HTH with former EUROCOPTER. About a month later, the company announced that it would start development by 2010 and that such an aircraft would not be available until 2018 at the earliest – and only if it could co-operate with another company. At that time, it seemed likely that it would be the Sikorsky Aircraft, but what is now AIRBUS-Helicopters collaborated with Boeing at HTH from 2010 on and developed a design that looked like a larger Boeing CH-47. The HTH was expected to carry the DINGO or FENNEK armed personnel carrier, the French VBL and VAB (13,000 kg), as well as WOLF and WIESEL (4,500 kg) or the BV 206/210. Another requirement was that the helicopter would use the same training equipment as the TIGER and NH90 helicopters. However, in the end, all the domestic European interest amounted to nothing. As national governments were rather cautious and the expected figures rather bleak, the HTH programme was considered too expensive.

## Remaining Contenders

More than ten years later, there are only US platforms left to choose from, as other alternatives (see below) are not politically feasible. Currently, some German officials support the larger CH-53K as it would allow growth for future missions. Others are pushing for the CH-47, which in their opinion is 'battle-tested', widespread and probably cheaper.

Photo: Lockheed-Martin Sikorsky



**In May 2018, the US Marine Corps took delivery of the first four CH-53K KING STALLION.**

What definitely is a significant difference is that the CHINOOK has a much higher loading height through the rear ramp due to the tandem rotor without tail rotor shaft. The loading height is more than five metres, which is not only higher than that of the KING STALLION (2.4 metres), but also higher than that of any other conventional rotorcraft. The CHINOOK can also use all 100% of its engine power for vertical lift, while his competitor – again like all normal helicopters – diverts 10 to 15% of the power for the tail rotor drive. So, both have their merits.

## The KING STALLION

The latest sibling of the initial HH-53 "Jolly Green Giant" (its 1960s nickname, after a mascot of the "Green Giant" vegetable company) is designated CH-53K or KING STALLION and will be of the same size and shape as its predecessor. The CH-53E SUPER STALLION from 1980, of which the Navy and the USMC acquired 177, was the first with three engines. With its now upgraded GE38-1B engine, it will be able to externally lift 27,000 pounds (12.2 tonnes), which is a more than three times higher load carrying capacity. The US Navy wants to buy up to 200 KING STALLION for the US Marine Corps. Allegedly, this was a prime motivation for Lockheed-Martin's US\$9Bn acquisition of Sikorsky Aircraft from United Technologies Corp. back in 2015.

The KING STALLION had its first flight on 25 October 2015, and in May 2018, the USMC received the first helicopter. The current budget called for the buying of 61 helicopters until 2023, based on an annual procurement rate rising from US\$1.3Bn last year to US\$2.3Bn. However, in its next five-year plan for FY 2020-2025, the USMC is now tentatively proposing to buy 10 fewer of these 'heavies' than planned and to reduce procurement funding over that period

by as much as US\$1.2Bn. At the moment, only six CH-53Ks for US\$718Bn are included in the President's FY 2020 budget presented in February 2019.

Some say there is a connection between this reduction and the first results of the test programme, which so far has reached almost 1,500 flight hours. Obviously, flight testing performance was not as satisfactory as anticipated as technical problems were either discovered belatedly or not sufficiently resolved.

Photo: USMC



**A USMC CH-53 SUPER STALLION lifts a RCAF CH-47 CHINOOK.**



Photo: MoD Italy



**An Italian CH-47 CHINOOK in Iraq. For many years, the CHINOOK has been a reliable workhorse.**

It is, therefore, likely that the test programme will miss the major milestone of the IOC (Initial Operational Capability, defined by the USMC as four aircraft that can be operated with trained crews and maintainers) in December 2019. According to Naval Air (NAVAIR) Systems Command spokesman Greg Kuntz and the US Office of the Director, Operational Test and Evaluation (DOT&E) on 31 January 2019, "the Programme Office is planning a major schedule revision that will include solutions to technical challenges such as tail rotor and drive shaft defects, airspeed anomalies, overheating of main rotor dampers and late deliveries of newly developed parts".

A noteworthy problem was the exhaust gas recirculation. Currently, exhaust-gas is being sucked in again, which limits the service life of parts such as the main rotor gearbox. However, Sikorsky CH-53K Programme Director Bill Falk said in January 2019 that "the current technical problems are solvable and solutions are in progress. For example, regarding the problem of exhaust gas recirculation discovered during flight testing, Sikorsky engineers are confident that they have a solution to solve the problem with minimal impact on ongoing flight testing and production. We have completed prototype designs, 3D-printed prototypes and identified suppliers for rapid prototyping. And we expect a solution to be integrated into production aircraft in 2019."

While the postponement is also due to a lack of sufficient funds to complete the System Development and Demonstration (SDD) phase within the original timeframe, due to the technical problems that have extended the SDD beyond the original forecasts, the USN has not yet formally established a new IOC date. Current forecasts expect IOT&E (Operational Tests) to start in early 2021. Should Germany decide in favour of the KING STALLION, the highly competent and charming son of the legendary founder and pioneer Igor Sikorsky, Sergey (94), said at the ILA Air Show 2018 in Berlin that Lockheed-Martin (with Sikorsky) has the following German industrial partners on board: Rheinmetall, which will lead the local efforts – MTU Engines, ZFL, Autoflug, Hydro, Rockwell-Collins Germany, Jenoptik, Hensoldt, Liebherr and Rohde & Schwarz.

Besides, RH-53D deminers in Iran (with questionable operational readiness), 33 CH-53D YASURS in Israel and 11 MH-53J in Japan and the predecessor of the KING STALLION, which is well established and appreciated in Germany, no other European country acquired the large Sikorsky rotorcraft – with one rather unexpected exception. In September 1970, Austria surprisingly acquired two of the so-called S-65OEE. This was a downgraded S-65C-2, very similar to what the USMC introduced at the time. Several flood and mud disasters in remote areas in 1965 and 1966 had highlighted the need for eight-tonnes lifting capability, and it was originally planned that each of the nine Austrian provinces would finance a heavy lorry. When the Socialists assumed office the following year, nothing was ever heard of these ambitions again, and the two heavy lift helicopters of 2nd Sqn Helicopter Wing 3 in Linz-Hörsching were surprisingly sold to Israel for a paltry €4M and flown out overnight on 14 May 1981.

This move was a result of Chancellor Kreisky's Middle East policy, although he later officially declared to parliament that the two had become too expensive to maintain. What is true is that Israel's IAF has been searching to this day for crash replacements for its very similar and worn-out YASURS it has been using since 1969. One of the two former Austrian aircraft allegedly crashed in 1996, while the other is still in IAF service as 065, although it has been significantly upgraded to the YASUR 2025 standard. According to the original plan, the type should have been in service until 2010 but it has since been upgraded to keep it in service until 2025. According to the IAF, there is no replacement for the old YASUR; there are no powerful VTOL aircraft capable of performing these missions. While Israel is already looking at the CH-53K, it believes that the US



Photo: Sikorsky

**Both Boeing and Lockheed Martin have already put together their German industry teams.**



will not be able to export it to allies until a few years after USMC completes the IOC. As far as possible priorities are concerned, however, the US military aid to Israel and an economic case in Germany are not really comparable.

## The CHINOOK

The only other competitor to the German MoD's tender is Boeing's latest version of the worldwide established tandem-rotor – the CH-47F CHINOOK. Of the 750 CHINOOKS operated by the US during the Vietnam war, about 200 were lost in combat and 500 were upgraded to the -D configuration. The author has visited the production line in Philadelphia shortly after the new production of F-models and the upgrade of up to 300 older D-versions to that standard had begun. In the meantime, production has risen to an astonishing four to six aircraft per month, divided between newly built CH-47s for the US Army and overhauled CH-47Ds. In the end, the US forces will operate 473 CH-47F. Production for 15 CHINOOK ordered by India is under way as well, with a first helicopter delivered in February 2019 to Mundra Port in Gujarat and ferried to its future base at Chandigarh. The subcontinent is the latest addition to the basket of 20 operators worldwide and six in Europe (UK, Netherlands, Italy, Spain, Turkey and Greece), with a total of 900+ airframes flying worldwide. The CHINOOK – the word designates a native Indian tribe from today's Washington state – marketed today by Boeing Rotorcraft has little to do with the aircraft that made its first flight as the YCH-1B by Boeing-Vertol in September of 1961. Improved and more powerful versions followed since its introduction, with the CH-47D being one of the most substantial versions. It first entered service in 1982 and improvements included upgraded engines, composite rotor blades,



Photo: Boeing

**Celebrating the delivery of the 300th CHINOOK to the US military.**

a redesigned cockpit to reduce workload, improved and redundant electrical systems and avionics and the adoption of an advanced flight control system. Next to the Lockheed C-130 HERCULES, it is one of very few aircraft developed in the early 1960s that have remained in production and front-line service for more than 50 years. And the CHINOOK has not stopped evolving since Boeing is developing a new standard called Block-II with increased capabilities to the F-model. And another re-evaluation is to begin from 2023 on and might even be followed by a Block-III. In that case, the design would still be around by 2060, which would make it more than 100 years!

Today, the CH-47F avionics is, of course, 'state of the art', with full screen MFD cockpits. The autonomy and power handling of the CHINOOK have also increased considerably. Block II includes the integration of new rotor blades, which increases its load capacity. The bow and stern area of the hull will be replaced and reinforced by new structures to accommodate the heavier and more powerful engines for Block III. The three lateral fuel tanks are replaced by a single tank capable of holding more fuel, which increases the autonomy of the aircraft. And in keeping

with the rapid progress in this segment, avionics will also need to be modernised.

The standard Block-II can be offered for export from 2025. This date should coincide with the start of Block III development when the US Army confirms its announced intentions. The objectives of this modernisation remain the same as for Block II – to increase load-bearing capacity and autonomy, improve avionics and develop interoperability. Boeing has already begun flight testing of the new rotor blades. This year three aircraft are expected to be converted and used as prototypes for Block II. Once approved, 25 to 30 Block IIs can be shipped out annually out of Philadelphia.

Of course, Boeing has also named its German industrial partners, should it win the contract. On board are ten companies such as CAE, Diehl, Honeywell, Liebherr, Reiser, Rockwell Collins Germany (also in the Sikorsky 'basket') and Rolls-Royce Germany. And, according to Chuck Dabundo, Boeing's Vice President Programme Manager of Cargo Helicopter programmes, there is potential for more to join. Last year, it was also announced that Boeing and Rohde & Schwarz had reached an agreement to integrate Rohde & Schwarz' next-generation software-defined airborne radio (SDAR) into the flight systems of the CH-47F/G CHINOOK helicopters.

Dr. Michael Haidinger, President of Boeing Germany, explained that Germany "is looking for a low risk standard solution with support, maintenance and training in Germany". Depending on Germany's requirements, both the CH-47F and the Extended Range MH-47G will be offered. However, air-to-air refuelling will be included in both variants. Support and maintenance will be carried out in Germany, as well as pilot and crew training with partner companies. With production up and running, Boeing Sikorsky is well ahead in terms of delivery times. Boeing is well positioned to deliver the 40 to 60 new helicopters between 2023 and 2031.

Photo: Georg Wader



**The cockpit of a CH-53K KING STALLION**



**The Sikorsky H-92 SUPERHAWK. With a MTOW of 12+ tonnes it is not as powerful as the CHINOOK and the KING STALLION.**

As mentioned, there are six European operators of the CH-47 series and some of them replace them or invest into modernisation, life-extension and upgrade steps. The Netherlands is pursuing both paths, with 14 new CH-47F acquired through FMS in 2016 and with an agreement with Boeing and the Netherlands MoD signed in December 2017 for upgrading six RNLAf CHINOOKs to the latest F-model configuration, ensuring commonality of systems for their entire fleet of 20 F-model CHINOOKs. Deliveries of the six modernised CHINOOKs equipped with a 'Common Avionics Architecture System' cockpit and an integrated 'Digital Automatic Flight Control System' are planned to begin in 2021. Programme Manager Colonel Koen van Gogh explained "Ever since their introduction in the mid-1990s, the CHINOOKs have been continuously involved in almost all of our missions abroad, but also in dis-

purchase of 11 CH-47F helicopters, with a first batch of six helicopters for US\$400M delivered until 2016. In 2015, Turkey placed a follow-on-order for a further five CH-47F. Assembled in the US and in Izmir, the purchase of these helicopters was processed under a US government FMS contract for US\$3.4Bn. In August 2018, the Turkish Presidency of Defence Industries announced that it had received the second batch from the US in spite of the ongoing crisis surrounding the delivery of F-35 jets to Turkey. Four of the CHINOOK helicopters in the second package are used by the Special Forces and one will be given to the MoD apparatus. Since 1962, the Spanish Army Aviation (Fuerzas Aeromóviles del Ejército de Tierra) operates a fleet of 17 CHINOOKs. Between 1982 and 1994, they were upgraded to the D-standard and recently, Boeing has announced that it will upgrade these heli-



**The Canadian CH-148 CYCLONE is based on the Sikorsky H-92, itself a spin-off of the 1998 civilian S-92 HELIBUS.**

aster relief operations and in domestic support. They are truly versatile workhorses of our Defence Materiel Organisation (DMO). It is responsible for providing the Dutch armed forces with the best equipment money can buy, and our troops deserve that. And that upgrade to a common configuration will improve operational effectiveness, maintenance, and affordability."

Turkey is another NATO country acquiring new CHINOOK airframes. In 2011, Turkey signed an agreement with Boeing on the

copters to the CH-47F standard. The decision by the Spanish MoD to modernise the CHINOOKs was taken in September 2018, for a sum of €820M. According to Boeing, modernisation will include the integration of digital flight controls and new avionics as well as modified internal and external lifting/slinging capacities. Meanwhile, these aircraft are operated by the 5th Transport Helicopter Battalion of the Spanish Mobile Air Forces, who is responsible for logistical support to combat units. The first modern-

ised CHINOOK is to be delivered in 2021. "The CHINOOK is a versatile aircraft flown by eight NATO nations, including Spain," said Chuck Dabundo. "With this contract, Spain's CHINOOK crews will enjoy the platform's current technology and capability, while the country gets an affordable upgrade that builds on its existing and well established H-47 investment."

In the 1980s, NATO partner Greece bought 10 CH-47C, nine of which were later upgraded to the CH-47D standard. In 2015, Greece bought three second-hand CHINOOK from the US National Guard. In 2016 and 2017, the Greek government purchased 10 former US Army CH-47D CHINOOK helicopters and had them repaired, modified and painted by Summit Aviation at Summit Airport in Delaware. All in all, Greece has a total of 15 DG/SD-helicopters in operation at Megara Airport

In Italy, 38 C-models were assembled locally for the Army Aviation (Aviazione dell'Esercito). Two were delivered in 1973 for evaluation. Subsequently, 26 airframes were upgraded to the CH-47C-Plus standard, with fibreglass rotor blades and T55-L-412E engines. In 2009, 16 new CH-47F were ordered by the General Directorate of Air Armaments to replace the CH-47C, with deliveries planned for between 2014 and 2017. AgustaWestland Italy is the prime contractor for systems integration, final assembly and aircraft delivery, and the first two helicopter were handed over on 2 October 2014 at Verigate. Furthermore, the CO.FS (Joint Forces Command for Special Forces operations) greenlighted the acquisition of four CH-47F in the ER (Extended Range) variant to equip the 3rd Army Special Operations Helicopter (REOS) 'Aldebaran' Regiment. The version chosen for the 3rd Regiment will be the same as the Canadian one, with larger standard fuel tanks and larger side sponsons. This modification will make it possible to greatly extend the range of the helicopter, without having to use an internal fuel-tank kit, thus avoiding sacrificing precious space for the transport of material and men. In addition, the request for the installation of an in-flight refuelling probe was forwarded to Boeing.

## No Real Western Alternative

Although it is not a real competitor for the German STH replacement programme, another western heavy lift helicopter has to be mentioned: The Sikorsky H-92 was developed on the basis of the civilian S-92 HELIBUS of 1998. With a MTOW of 12+ tonnes it is not as powerful as the CHINOOK and the KING STALLION. The Sikorsky H-92 has so far only found one customer with the Ca-



nadian naval helicopter CH-148 CYCLONE. Unfortunately, since 2004 the programme has developed into a textbook example of what not to do in a military acquisition. While Canada's 50-year old SEA KING fleet aged and deteriorated to dangerous levels, political pettiness and lack of concern turned a straightforward off-the-shelf buy into a 25+ year long odyssey of cancellations, lawsuits, rebids and so on. Eventually, the Canadian military settled on Sikorsky's MH-92 SUPER-HAWK, which will serve from the decks of Canada's naval ships and bases. It is a larger derivative of the ubiquitous H-60 family that comprise most of the USN's current fleet and makes heavier use of salt/rust-proof composite materials. It also sports uprated GE CT7-8C engines rated at 3,070 hp (2,290 kW), a rear ramp and other features that place it slightly ahead of Europe's NH/NFH-90. The H-92 can carry up to 3,030 kg of fuel in standard self-sealing fuel tanks, while an in-flight refuelling probe allows in-air refuelling for extended range flights. A 17 cubic metre cabin is fitted with a cargo handling system with a centreline 1,814 kg/4,000 pound capacity cargo winch, floor rollers and cargo tie-down points. A six foot-wide aft ramp allows easy and fast loading and unloading of cargo and troops. A 272 kg/600 pound capacity hydraulic rescue hoist can



Photo: ROSVERTOL

**The Russian M-26T HALO is the world's largest heavy lift helicopter.**

siderations by European countries but with a length of 40 metres and a rotor-diameter of 32 metres. By far the largest or heaviest-lifting rotorcraft anywhere, of course, is the Russian Mil-Mi-26 (NATO designation HALO). Able to lift a fully loaded CH-53, it first flew in 1977, can transport more than 25 metric tons or carry 82 combat-ready troops and a range of combat vehicles. The HALO still holds the world-record for the heaviest mass lifted to 2,000 metres (6,562 ft) – 56,768.8 kilogrammes (125,153.8 lb) on a flight in 1982. About 20 HALO are in service with the Russian Air Force and Border-Guard – 14 HALO were exported to Algeria,

ate day and night in automatic mode. An NVG-friendly cockpit is fitted with MFDs, which considerably enhances the aircraft's controllability and allows to eliminate the flight engineer and navigator stations, while crew protection has been increased with hardened and crash-worthy seats.

The world's newest addition to the heavy lift sector is a helicopter modelled on the HALO – the Chinese-Russian "Advanced Heavy Lift" concept. This helicopter is also larger than all the others in the West. At IDEX, Viktor Kladov, a high-ranking ROSTEC representative, declared that development contracts "will soon be signed". What he called "the contract of the century signed with AVIC and its partners" developed in four years of back and forth discussions as a joint venture to develop a new heavy multi-purpose helicopter with a maximum take-off weight of 40 tonnes. Specifications are 15 tonnes payload, a range of 630 kilometres and a maximum speed of 300 km/h. The helicopter will have a maximum lift capacity of 15 tonnes. All this clearly points to the Chinese Military (PLA), which urgently needs more heavy helicopters to increase its readiness in the event of a military emergency, major natural disasters or to support yet another island fortification far off its own coastal waters. PLA's current helicopter squadrons consist mainly of medium-sized transporters such as the Z-9, Z-20 and Mi-17. The Chinese know the Mi-26T because Beijing leased a number of Mi-26s after the devastating Wenchuan earthquake in May 2008 to transport relief supplies, first responders and injured civilians in Sichuan province. Chinese media welcomed the orange Mi-26s as they flew first aid and heavy earthmoving equipment to some of the devastated villages that could only be reached by air or trail. And, if there is no war or large troop deployment, deployments like these will most likely be the reason that such heavyweights could be much easier to sell to the public and taxpayers than most other military equipment. ■



Photo: Georg Mader

**A model of the Chinese-Russian Advanced Heavy Lift Helicopter Project**

reportedly be installed if necessary, while a Telephonics APS-143B radar, a HELRAS active dipping sonar system supplemented with launched sonobuoys and a Star SAFIRE-III day/night IR/EIOps surveillance turret offers a good mid-level sensor set. In 2014, the S-92 was selected as the future MARINE ONE flying the US-President as the VH-92A. 21 of them are on order with the first flight witnessed in 2017.

## Eastern Heavy Lifters

Due to the current climate between the West and Russia, it is not subject for con-

China, India, Jordan, Mexico, Peru, and Venezuela. A civilian Mi-26 was once leased by the US military to lift-out a couple of damaged and crippled CH-47s and UH-60s from various spots in Afghanistan. On 19 August 2018, the Russian industrial conglomerate ROSTEC, the parent company of 'Russian Helicopters', announced the first flight of a prototype of the latest military version. As the original engine manufacturers Ivchenko and Motor Sich are now in Ukraine, the Mi-26T2V has gotten new Aviadvigatel PD-12V engines and features the NPK90-2V avionics suite, which allows the helicopter to oper-



# Airborne Early Warning: Watching the Noisy Neighbours

**Alan Warnes**

**The airborne early warning (AEW) aircraft is a high value asset that not many countries can afford.**

As a commanding officer of an AEW Squadron recently told the author, "Our aircraft can peer hundreds of miles into our adversary's air space, giving us notice of their intentions. We can watch all their aircraft's manoeuvres to provide us with ample opportunity to scramble our assets into the air."

As India and Pakistan went close to all-out war on 27 February 2019, we saw airborne early warning assets from both sides playing a significant part in the unfolding drama. When the IAF's Air Vice-Marshal R GK Kapoor was responding to denials that the IAF had shot down an F-16 in early March, he responded by showing a declassified radar track from one of the IAF's AEW aircraft. He also provided two images, believed to have come from an A-50Ei PHALCON, of three Pakistan Air Force fighter formations being tracked. One made up of JF-17s and the other two were F-16s. One of the jets in the latter group disappeared from the screen, which the IAF claim was because it crashed. The PAF denied that they had lost a VIPER and US sources claimed all the F-16s were still in the inventory.

Having scoured the adversary's airspace, airborne early warning and control (AEWC) platforms can gather information from a wide variety of sources, analyse them, distributing them to other air and surface as-



Photo: Alan Warnes

**The UAEAF&AD has contracted Saab to deliver three cutting edge GLOBALEYE Multi-Role Sensor Systems (MRSS) in a deal worth US\$1.5Bn. The first aircraft, without UAE marks, made its first flight on 14 March this year.**

sets. They control the tactical battle space with a variety of tactical options on offer. Monitoring the movements of your foe's aircraft, ships or vehicles is one. They can also offer command and control, provide direction for fighter aircraft, surface combatants and land-based elements, as well as support aircraft such as tankers and intelligence platforms. Alternatively, they can distinguish between allied and enemy forces to reduce the chances of 'blue-on-blue' incidents.

## Recent AEW Acquisitions

With more new sophisticated threats emerging from both Russia and China, it is not surprising that both the RAF and US Navies have in recent months bolstered their respective AEW forces. On 22 March 2019, the then UK Defence Secretary Gavin Williamson signed a US\$1.98Bn deal to purchase five Boeing E-7 WEDGETAIL AEW aircraft to replace the RAF's current fleet of five E-3D SENTRY AEW1s. The contract had been expected for some time. Williamson said: "The E-7 provides a technological edge in an increasingly complex

battlespace, allowing our ships and aircraft to track and target adversaries more effectively than ever. We will operate 'state-of-the-art' F-35 jets and world-class Type-26 warships, and this announcement will help us work even more closely [with our allies] to tackle the global threats we face."

Chief of the Air Staff, Air Chief Marshal Sir Stephen Hillier also stated: "This world-class capability, already proven with our Royal Australian Air Force partners, will significantly enhance our ability to deliver decisive airborne command and control and builds on the reputation of our E3D SENTRY Force."

The E-7 is based on a standard Boeing 737 NG airliner modified to carry a sophisticated Northrop Grumman active electronically-scanned radar mounted in a 'Top-Hat' configuration on its roof, which can cover up to four million square kilometres over a ten-hour period. Modification of the aircraft will be carried out in the UK at the Marshall Aerospace and Defence Group in Cambridge leading to the entry into RAF service by the early 2020s at RAF Waddington, Lincolnshire.

## 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 magazine in the UK, before opting to go freelance. He has also written several books, including two on the current Pakistan Air Force in 2008 and 2017, and, most recently, on 100 years of Aero Vodochody.



Photo: RAAF

**The Royal Australian Air Force withdrew its Air Tasking Group from the UAE in early February and with it the Boeing E-7 WEDGETAIL.**

On 11 April, Northrop Grumman announced that it had been awarded the contract to deliver an additional 24 E-2D Advanced Hawkeye aircraft to the US Navy. The deal, valued at US\$3.2Bn, includes an option for nine additional foreign military sales aircraft. Production of the 24 US Navy aircraft, funded by the five-year contract, is expected to be complete in 2026. The US Navy's Captain Keith Hash, of the E-2/C-2 Airborne Tactical Data Systems Programme Office (PMA-231) Manager, said of the deal, "This is a critical element in providing the next generation of world-class command and control aircraft to the fleet and helps us fulfil our mission to increase US naval power at sea by providing our fleet the information they need to accurately plan and win the fight today and tomorrow." The carrier-based E-2D with its powerful AN/APY-9 radar is the US Navy's airborne early warning and command and control aircraft system. Generally, the small twin turboprop provides an expanded battlespace awareness for aircraft carriers and their strike groups. Northrop Grumman claims the E-2D is a two-generation leap in radar technology, allowing it to work with ship-, air- and land-based combat systems to track and defeat air, ship and cruise missiles at an extended range.

### UK's AEW Helicopters

During the 1982 Falklands War, the Royal Navy did not have an airborne early warning aircraft, having retired the Fairy Gannet AEW in 1978. They paid for it by suffering the loss of nearly 100 sailors and soldiers that were killed on board six ships attacked and sunk by the Argentine navy and air force.

It taught the Fleet Air Arm a costly lesson and made the rest of the world's military ensure they provided their battle ships and aircraft carriers with the best protection. Until September 2018, when the FAA's

SEA KING ASaC7s were retired, its main AEW role was to detect low-flying attack aircraft as well as the interception and over-the-horizon targeting for surface-launched weapon systems. The ASaC7 could simultaneously track up to 400 targets.

The new generation CROWSNEST MERLINS are now going through test and evaluation before being delivered. The UK ordered ten CROWSNEST systems from Lockheed Martin on 16 January 2017, which are modular kits that can be fitted to any of the 30 MERLIN HM2s operated by the FAA. Lockheed Martin, as the prime contractor for CROWSNEST, is integrating the Thales system, an updated and improved version of the CERBERUS tactical sensor suite, which was in service with the ASaC7 helicopter. The design comprises a single mechanically scanned radar head, to provide a 360 degree visibility from the system, which is fitted to the underside of the helicopter that can then fold up to the side of the aircraft when not in operation. The Chief Executive Officer of the MoD's

Defence Equipment and Support body, Tony Douglas, said in January 2017, "CROWSNEST will play a key role in protecting the Royal Navy's future fleet acting as the eyes and ears for the new QUEEN ELIZABETH class aircraft carriers. This 'state-of-the-art' project will demonstrate how we are providing world-leading, innovative equipment to our Armed Forces." The official maiden flight took place on 28 March, when the trials aircraft flew from Leonardo's Westland facility to commence aero-mechanical flight trials. Ross Powlesland, Managing Director at Military Solutions, Lockheed Martin UK said at the time, "The objective of this phase of work is to assess the flight envelope and handling qualities of the aircraft with the external equipment fitted. A series of flight trials will take place throughout 2019."

### RAAF WEDGETAIL

In early February, the Royal Australian Air Force (RAAF), which operates six E-7A WEDGETAILS ended its Operation Okra deployment to Minhad Air Base in the United Arab Emirates. No 2 Squadron, home-based at RAAF Base Williamtown, New South Wales, has been flying from the UAE base as part of Australia's Air Task Group (ATG) since 1 October 2014. The E-7A WEDGETAIL can track airborne and maritime targets simultaneously, with a variety of sensors and sources, analyse them, distributing them to other assets. The systems on board include HF, VHF, UHF, Link-11, Link-16 and UHF SATCOM while electronic warfare self-protection includes infra-red countermeasures, chaffs and flares.



Photo: Alan Warnes

**The oldest AEW aircraft still operational is the Boeing E-3, known by the USAF as the Airborne Warning and Control System. The example depicted here is operated by the Royal Saudi Air Force and escorted by two TORNADO aircraft.**

A senior RAAF officer, Air Cdre Akren who was heading up the ATG in early 2018 said, "The picture from the E-7 is a higher quality picture than other AWACS such as the USAF, RAF and French E-3s, and it can navigate through the picture better in terms of working out who's who in the zoo, so speak."

Three air forces are today flying the E-7 – Australia (6), South Korea (4) and Turkey (4).

## AWACS

The most popular AEW aircraft today is still the Boeing E-3 Airborne Warning and Control System (AWACS), despite the first examples being delivered in the mid-70s. Today, there are five custom-

against Daesh while also keeping track of Russian aircraft operating over Russia without using their Identification Friend or Foe (IFF) transponders.

NATO is also upgrading 14 of its E-3s with new flight decks and avionics suites, which will replace its 1970s era analogue systems. Boeing was awarded a US\$257M upgrade contract in 2014 to integrate five full-colour digital glass displays with customisable radar, navigation and engine data. The work was started on the pattern aircraft in the US during August 2016, before the work was transferred to Airbus at Manching, Germany. The last aircraft was delivered on December 2018.

In May 2017, Boeing announced that it had completed the Radar System Improve-

other systems into the battlespace to shape greater situational awareness in the battlespace. You can put the energy in the mission area where you have the highest priority."

Japan, the only country to have purchased the Boeing 767 as an AEW&C, operates four Boeing E-767s and despite initial problems they have now settled in. They are being augmented by four E-2D HAWKEYEs, at a cost of US\$1.7Bn, which will include associated equipment, spares and logistical support. A US\$151.3M order for the first aircraft was contracted on 12 November 2015. Egypt operates seven E-2C HAWKEYE 200s, France 3 E-2C HAWKEYE 2000s, Japan two E-2Ds plus two more on order and a requirement for another five, Taiwan (Republic of China) operates six E-2K HAWKEYEs and the US Navy has 36 E-2Ds and another 39 on order.

## ERIEYE

A new threat to US dominance in the AEW market comes from Saab's GLOBALEYE. The Global 6000 mounted with a new generation ERIEYE ER radar won a US\$1.27Bn contract from the UAE Government in November 2015 for two aircraft, which was increased to a third aircraft worth a further US\$235M in February 2017. The GLOBALEYE beat off competition from the Boeing E-7A and Northrop Grumman E-2D, which had been working on a deal for more than ten years.

Matts Wicksell, the Saab GlobalEye Programme Manager told me about the capabilities the new platform can offer, "We can see extremely small subjects, like rib boats, and jet-skis from the air and we can see stealthy targets at a longer distance." This has been made possible because mounted on top of the airframe is the S-band active electronically scanned array (AESA) ERIEYE ER (Extended Range) multi-mode radar. Saab claims it has a detection range, which has been improved by over 70%, compared with the previous generation model, to more than 300 miles (450 km). Augmenting the ERIEYE is a Leonardo SEASPRAY 7500 maritime radar, which can track up to 300 targets, and a STAR SAFIRE 380HD Electro Optical/Infra Red (EO/IR) turret. The jet must descend to around 5,000 ft to allow the operators in the rear cabin to focus on anything of interest.

With eight countries flying ERIEYE systems on three different platforms, Saab has the biggest network of AEW operators. They are Sweden (two Saab 340s), Brazil (three EMB 145/R-99s) Greece (four EMB-145H), Mexico (one EMB 145SA), Pakistan (three

Photo: Alan Warnes



**An AEW configured GULFSTREAM 550 of the Republic of Singapore Air Force**

ers operating around 50 active aircraft include the USAF (24), NATO (15), French Air Force (4), RAF (5) and the Royal Saudi Air Force (5).

Most of the E-3s have been through regular upgrades to overcome obsolescence and to remain up to date with new emerging threats that currently exist. Under a US\$2.7Bn upgrade, the USAF is upgrading 24 E-3s with a new more sophisticated RED HAT Linux-based system to replace the antiquated 1970s/80s systems. Development of the E-3G Block 40/45 upgrade started in 2003, and includes the fusing of air, land and sea tracks into one single integrated sensor display, in line with most modern AEW systems.

An E-3G was deployed into combat for the first time in November 2015, to Al Udeid, Qatar, where, like the RAAF E-7Ts flying out of Al Minhad, it was used to coordinate the multinational air campaign

ment Programme (RSIP) on the Royal Saudi E-3 AWACS fleet, which began as a joint US/NATO development programme. The kit, built by Northrop Grumman, includes a new radar computer, a radar control maintenance panel, and electrical and mechanical software and hardware.

Keith Burns, Saudi AWACS Programme Manager for Boeing said in May 2017, "The modernised software, multiple radar nodes and overall enhanced operation make this the most significant upgrade to the AWACS radar since it was developed in the 1970s."

As one Boeing engineer put it to the author, "The main difference between the WEDGETAIL and the AWACS is you are not limited or defined by a 360° rotator. You can configure how much power you want to put into your radar reach; it is configurable to the mission. The integrated IFF and radar functionality also allows the system to reach further than



Saab 2000s plus two on order), Saudi Arabia (two x Saab 2000s) and the UAE (two Saab 340 with three Bombardier 6000 GLOBAL-EYES on order).

## Gulfstream CAEW

The Israel Air Space Force operates four heavily modified Gulfstream 550s for the AEW mission. The Eitam is fitted with the EL/W-2085 multi-sensor suite, which provides a full 360-degree coverage, with its narrower field S-band antennas on the rear and forward spheres of the aircraft, as well as wider-scoping L-band antennas mounted on the sides of the G550 CAEW fuselage. It has a ten-hour endurance and a 7,000 km (5,500 miles) range. The most recent customer for the Israel Aerospace Industries (IAI) Gulfstream 550 is the Italian Air force, which took delivery of two jets in 2016/17 in a US\$750M deal made in 2012.

The Republic of Singapore Air Force (RSAF) bought four Conformal Airborne Early Warning (CAEW) configured Gulfstream 550s for US\$1Bn from IAI Elta in May 2007. The CAEW, with its EL/W-2085 sensor suite, has revolutionised the way the RSAF carries out its AEW role after flying the E-2C HAWKEYE for 23 years.

## India and Pakistan

The Indian Air Force purchased three Embraer EMB 145s in a US\$208M deal, leading to the first delivery on 14 February 2017. They are fitted with an indigenous Defence Research & Development Organisation (DRDO) AEW&C system known as NETRA. Equipped with a 240-degree coverage radar and a 240 mile range to detect, identify and classify threats. They work alongside three AEW&C configured Ilyushin Il-76s known as the A-50Eh1, purchased under a US\$1.1Bn deal, which saw the original airframes modified with the IAI EL/W-2090 AEW&C PHALCON radar system by Israel Aerospace Industries (IAI) and its subsidiary Elta at Tel Aviv-Ben Gurion Airport. These were delivered between 2009-2011. Another pair are believed to be on order. The radar is able to track multiple fast moving targets at a range of up to 250 miles (400 km), and a communication suite, which guarantees the secure voice, and data links to air, ground and sea.

The IAF is now close to clearing the way for the acquisition of two Airbus A330 that will be configured with DRDO's indigenous system. DRDO Chairperson, S Christopher told reporters at Aero India 2017 in February, "the system mounted on the Airbus, will have 360-degree surveillance and a coverage area of 300 km."

## Staying Informed and Alive

### Saab's Ideas on Airborne Electronic Warfare

(Ulrich Renn) Now that the focus of military readiness is shifting from asymmetric operations to the deployment of traditional combat troops, radar threats are regaining importance. At the same time, the electronic warfare (EW) environment is becoming increasingly complex:

- Stealth and counter-stealth technologies are leading to increasing interest in surveillance radars operating in low-frequency bands (VHF/UHF).
- The proliferation of modern long-range anti-access/area denial systems calls for more complex and sophisticated protection systems.
- Radar sensors are increasingly agile.
- Nowadays, communication systems (military and commercial) work on frequencies previously reserved for radar.
- Traditional separation of passive sensors for radars and communications is becoming less and less relevant.
- Traditional receiver technology is rapidly becoming operationally obsolete.
- Traditional threat libraries are becoming extremely difficult to keep up to date.
- The line between traditional electronic warfare and cyber attack is becoming blurred.

This requires advanced electronic combat systems capable of protecting airborne platforms from all elements of the air defence kill chain, from surveillance and target acquisition to target tracking and weapons deployment, with the aim of disrupting the chain as early as possible.

By cleverly combining long-term research programmes with product-oriented research and development, Saab has developed a technology platform for EW systems that leads the world in outsmarting even the most advanced threats. These systems employ Gallium Nitrate (GaN) transmitters, wide band Active Electronically Scanned Antenna Arrays (AESA), ultra-wide band digital processing of radar frequency signals, signal and data processing enhanced by artificial intelligence, machine learning and cognitive algorithms, precision direction finding and localisation as well as stealth-enabled countermeasure systems (that do not increase a platform's radar signature).

The most advanced and complex product of this kind is AREXIS, a family of EW systems for the self-protection of airborne platforms. The first version of this system will be the onboard EW suite installed in GRIPEN E. To strengthen self-protection and disrupt the kill chain already at the surveillance and target acquisition stage, AREXIS will also include an electronic attack (EA) jammer pod that can detect and jam surveillance and acquisition radars in frequency bands ranging from VHF/UHF to the L and S bands. Both the onboard suite and the jammer pod can be adapted to other platforms.



Photo: Saab

The Pakistan Air Force operates the ERIEYE system mounted on the Saab 2000, augmenting four ZDK-03 Korakoram EAGLEs delivered between 2010 and 2012. The aircraft are Shaanxi Y-9G airframes with a dome on top. China Electronics Technology Corporation (CETC) has upgraded the four Shaanxi Y-9G airframes, fitting the AESA radar in the dome. At Zhuhai Air Show in 2018, CETC displayed two different Y-9 AEW&C aircraft. A KJ-500/ZDK-06 with a dome on top appeared in the static display, while two models of the same K/JE-03 stood at the stand, with the balanced beam radar, but presented in different colour schemes. Like the event in 2016, a video also was played showing a more flexible means of attack and defence in the newer ZDK-06. Working

with command centres, fighters, UAVs and navy ships, the aircraft's data-link provided the information it was detecting over long-ranges, down-linked

the aerial picture and up-linked data from ground-based air defences. The ZDK-06 is also said to offer mid-course guidance, updating a missile's trajectory en-route to a mobile target.

Obviously, AEW plays an extremely important role within the military, which is the reason that the systems and aircraft operating all over the world come in all shapes and sizes. They provide countries with a sense of situational awareness in their would-be adversary's 'back-yard', an opportunity to defend against any possible aggression, and strike back almost immediately. ■

# “Belgium needed to invest in new major equipment to be prepared for the future.”



Photo: MoD Belgium

## Interview with Lieutenant General Rudy Debaene, National Armament Director of the Ministry of Defence of Belgium

**ESD:** In many western countries, the changed security-political situation in Europe has induced governments to allocate additional funds for defence and armament. To what extent and in what way has this trend influenced things in your country?

**LtGen Debaene:** Of course, Belgium follows this mainstream as we are part of Europe and the European security environment. But next to the trigger of the changing security situation, as our legacy systems are slowly reaching their end of life, Belgium needed to invest in new major equipment to be prepared for the future. Other elements that influenced the strategic investment plan are the shortfalls that are/were identified within NATO and within the European Defence arena: tanker aircraft, MALE drones, unmanned systems, communication assets, protection against cyber-attacks, and so on. All these elements are at the basis of the investments part in the “Strategic Vision for Defence” approved in June 2016.

**ESD:** What are the most important military aerospace programmes in your country, both current and forthcoming?

**LtGen Debaene:** Next to the Agusta A109, we operate since 2014 the NH90 helicopter in close relationship with our European and international partners in the project. Our C-130 fleet will be replaced from 2020 on by A400M, a decision our government already took in the beginning of this century. Next to that, we engaged in the EU MRTT project for the equivalent of 1000 flying hours and our “white fleet” is subject of an “outsourcing” project for the equivalent of

2000 flying hours intercontinental business jet, with the possibility for leasing wide body aircraft within the same contract. This part of our fleet will be “completely European” and will be put under the EATC.

Our F-16 fleet is ready to leave service in the 2023 – 2028 period and will be replaced by F-35 combat aircraft. Here we seek to link up with our other European partners (Netherlands, UK, Denmark, Norway, Italy, and so on), but due to or rather thanks to the connectivity on board (such as Link 16), we will be able to cooperate with all other European and international partners as we do for the moment being.

Belgium is contracting MQ 9B MALE drone systems through an FMS case with the US that are to be delivered in the 2023 timeframe. Concerning “image intelligence” we joined the MUSIS-CSO project under French lead and in the area of satellite communication, we partner up, amongst others, with Luxemburg in their Gov-SatCom programme.

**ESD:** What share of your procurement funds is invested in military aerospace R&D and what are you concentrating on?

**LtGen Debaene:** It is difficult to give a precise indication of this percentage, but Belgium is supporting several EDIDP programmes with elements of aerospace R&D in it: the first one is called HAPS, “high altitude pseudo satellite”, that heads for a long endurance airborne system (based upon solar energy), able to carry communication systems or image sensors on board. We also support an EDIDP project that aims at generating a “European protected waveform” in satellite communications. Next to that, our industry will get the opportunity to be involved in high tech industrial work packages and R&D topics together with the partner industry in the F-35 programme.

**ESD:** Which of these are carried out in international partnerships, and who are your partners?

**LtGen Debaene:** For the F-35 programme, it will be US as well as EU industrial partners and MoDs. For the EDIDP programmes, industry still is in negotiation phase with their international partners, but we have already identified potential EU nations that show interest in joining up.

Photo: MoD Belgium



**Together with the Netherlands, Belgium has just launched two major naval procurement programmes; Belgium is the lead nation in the procurement of Mine Counter Measure Vessels (MCMV).**

**ESD:** What are your nation's current activities and considerations in the framework of PESCO (Permanent Structured Cooperation) and what are your plans?

**LtGen Debaene:** Belgium is lead nation in the “MAS – MCM” project, that looks at the follow-up for the existing maritime autonomous systems for mine counter-measures. Next to that, Belgium joined as “partner” in 10 projects and as “observer” in another 4 programmes.

**The questions were asked by Peter Bossdorf**

# UAS Detection and Countermeasures

**Sidney E. Dean**

Unmanned Aerial Systems (UAS) have become ubiquitous. More than 600 types of UAS are currently in use in eighty nations. They range from multi-million-dollar aircraft rivalling manned military systems in capability, to small and cheap Unmanned Aerial Vehicles (UAVs, meaning the “airplane” or “helicopter” part) which can be purchased online and controlled via laptop or smartphone.

Increasingly, non-state actors – including Hezbollah, al Qaeda and Daesh (ISIS) – are deploying the latter as camera-equipped reconnaissance aircraft. More recently they have begun weaponising small quadcopters, and small-to-medium-sized UAVs with up to ten feet wingspan, to drop grenades or mortar-sized bombs on Iraqi and Peshmerga forces. Globally, security services are also concerned about “suicide-drones” packed with high-explosives. And nation-states are themselves acquiring small and micro-UAVs as reconnaissance and attack systems.

When the G7 summit was held in Germany in 2015, the German security forces also introduced a special asset against small drones. Under the leadership of the company ESG the industry partners Diehl Defence and ROBIN Radar Systems deployed a joint solution as a defence against threats due to the unauthorised use of commercial micro-drones. The solution focused on electronic detection, verification and countermeasures as well as appropriate means of command & control.

In light of this growing threat, many nations are pursuing Counter-UAS (CUAS) technology in tandem with fielding their own UAS. Since large UAS can normally be detected and targeted using conventional air defense systems, these CUAS efforts are mostly directed against small- to medium-sized unmanned aircraft which often have a minuscule radar profile and a low noise signature. At this point government agencies rely heavily on industry to help define viable technologies and operational concepts. CUAS elements are being incorporated into exercises and field experiments, while several dedicated CUAS experiments are conducted annually. The largest, BLACK DART, is hosted by the US Air Force with more than



Photo: ESG

***This joint solution of ESG, Diehl Defence and ROBIN radars protected the G7 summit in Germany effectively against the unauthorised use of micro-drones.***

50 counter-UAS systems evaluated during each year's exercise. The search for CUAS goes well beyond the terrorist threat, with the US military and other nations' armed forces seeking systems capable of deterring and defeating peer-level unmanned aerial systems.

## Find and Fix

The first order of business is developing systems to reliably detect, identify, and track adversary UAS. This is particularly challenging for smaller UAVs, especially in urban canyons where sightlines can be short and few. Several detection and surveillance systems are already on the market or nearing operational capability. Most rely on a combination of sensors.

In September 2015 Finmeccanica's British subsidiary SELEX introduced FALCON SHIELD, a modular, multi-tiered system optimised to combat low-and-slow-flying small UAS against the “background clutter” typical of urban environments.

Sensor options include high-definition electro-optical/infrared (EO/IR) cameras, radio-frequency (RF) sensors, highly sensitive microphones to detect UAV engine noise, as well as radar providing panoramic or sector surveillance. The sensors can be fixed, man-portable or vehicle mounted, including the option of trailer-based extendable mast systems for increased range. The C2 suite identifies and classifies the targets while the sensors track the flying object, allowing it to be attacked and neutralised at range with a variety of weapons and technologies. Selex also touts the option of taking control of the drone and landing it safely, eliminating the danger that a falling drone causes injuries on the ground. SILENT ARCHER, a system introduced by Syracuse (New York) based SRC Inc, functions similarly to Falcon Shield. The US Army in 2017 contracted to buy fifteen systems – ten mobile and five fixed – for US\$65M, followed by a US\$108M order January 2019; the US Air Force placed

## Author

**Sidney E. Dean** is President of Transatlantic Euro-American Multimedia LLC. and a regular contributor to ESD.





Photo: US DoD

***The annual Black Dart exercise tests innovative concepts for the detection and neutralisation of UAVs.***

a US\$57M order in 2018 (US\$57M). According to SRC, the combination of radar signature and RF signature data is sufficient for positive classification and identification of particular UAS; confirmation and additional information are obtained visually via EO/IR sensors. The system can be deployed against single drones and drone swarms. It has been used to secure high-profile international summits as well as the 2012 Olympics.

Israeli Aircraft Industries' DRONE GUARD system centres on ELTA air-surveillance radar

systems paired with special detection and tracking algorithms as the primary small-UAS detection agent, augmented by EO/IR sensors. ELTA radar can detect UAS at several kilometres' distance. Since its introduction in 2015 IAI has sold hundreds of units to ten countries. In November 2018 IAI presented the latest generation DRONE GUARD. The upgrade adds a communications intelligence system to enhance detection of the frequencies employed with drones. The 3D radar, electro-optical sensors and jamming systems have also been improved.

Israel's Rafael has introduced the DRONE DOME system with 360 degree radar coverage, electro-optical identification and an RF jammer. A 5 kW laser is optional as a "hard-kill" solution. Both the jammer and laser have a 2.5 kilometre range. The UK acquired the DRONE DOME without the laser in 2018. And in November 2016 Russia's Zavod Elektromash announced that it was developing a vehicle-mounted non-emitting radar with a detection range of 20 kilometres. The passive radar will not trigger enemy radar-detection sensors. According to a Zavod Elektromash spokesman the system will detect "sophisticated stealth drones of various types".

## Kinetic Countermeasures

The most obvious defence against hostile UAVs is to shoot them down. At the tactical level – where counter UAS operations take place – any available weapon can theoretically be directed at a drone. "We're looking at everything from shotguns to water cannons," said Lieutenant Colonel David Sousa of the Marine Corps Combat Development Command. Various kinetic solutions are being studied and applied, ranging from machine guns to air-burst air-defense artillery shells; ground-, air- and sea-based weapons are equally viable. During the 2016 BLACK DART CUAS exercise a US Marine Corps sniper riding in a helicopter downed a FLANKER UAV (wingspan: seven feet) using a precision rifle. One drawback of most infantry weapons in the CUAS-role is their limited range.

However, air-defence missiles are not a viable alternative. In addition to effectiveness, military planners must consider proportionality and economy. A senior US Army general related in 2017 that a US ally had shot down a US\$300 quadcopter UAV using a US\$3M PATRIOT missile. Even discounting the cost-effect ratio, this is not an acceptable CUAS strategy. State actors could quickly deplete an adversary's air-defence arsenals by launching waves of cheap UAS before committing manned (or sophisticated unmanned) aircraft and missiles.

That principle also holds for deploying intermediate value missiles such as the HELLFIRE, STINGER, and AIM-9, all of which have been successfully tested against drones. The US Navy has also successfully tested the much smaller and cheaper SPIKE missile in the CUAS role, using the projectile's proximity fuse to destroy two small aircraft. The US\$5,000 SPIKE has a range of 3.2 kilometres and can be deployed by dismounted infantry, vehicles, boats or aircraft, making it a more viable CUAS option.

Photo: US DoD



***The AVENGER short-range air-defence system features eight STINGER ground-to-air missiles in vehicle-mounted launcher tubes. The US Army has decided to deploy 72 AVENGER systems to Germany as a full complement for two battalions. One battalion set will be activated and the other battalion set will be placed in prepositioned storage. A major mission component of the battalions will be defence against Russian drones.***

## Jamming and Hacking

Regardless of type, kinetic CUAS solutions are not considered optimal, especially over urban terrain where projectiles and drone parts could inflict unintended casualties. The prospect of future deployment of drone swarms containing dozens or even hundreds of very small air vehicles could ultimately make kinetic defence virtually impossible. For these reasons military planners are increasingly turning to electronic countermeasures (ECM) to disrupt UAS radio-control frequencies and/or GPS-navigation signals. ECM systems have already proven themselves in real-world CUAS operations. According to US Army sources, Russia has demonstrated a very capable UAS-jamming and hacking capability during operations in the Ukraine since 2014, disabling western-built reconnaissance drones operated by Kiev. And the commander of the Iraqi Counterterrorism Service in early 2017 credited a US-operated, vehicle-mounted jamming system (identified only as the "interference machine") with completely halting Daesh UAS operations around Mosul.

Increasingly, vehicle mounted and fixed CUAS systems are being developed that permanently integrate detection, tracking and engagement capabilities for greater effectiveness. Some are designed with open system architecture which allows multiple hardware configurations, including an array of controllers and sensors for target detection, tracking and engagement. The final configuration is determined by operational requirements and the client's preferences. Other systems have a fixed configuration. A sophisticated CUAS system is supplied by Airbus Defence and Space. It includes a SPEXER 500AC radar, NIGHTOWL Z thermal imaging camera and laser rangefinder, SKYLARK 7050C direction finder, UAV database and VPJ-R6 jammer. The radar has an effective range of up to 10 kilometres, while the remaining sensors and the jammer have a maximum range of 2 kilometres. The AUDS (Anti-UAV Defence System) developed by a British consortium consists of a BLIGHTER Systems A400 Series Ku-band electronic scanning air security radar; the Chess Dynamics HAWKEYE stabilised electro-optic director, infrared and daylight cameras, and target tracking software; and a co-mounted (with the EO/IR sensors) directional RF inhibitor from ECS which disrupts the command-and-control channels of the UAS, forcing the target to the ground. AUDS has been tested against 60 different small UAS types. The radar consists of two 180 degree arrays placed back to back. The 360 degree radar can acquire targets at a distance of 10 kilo-

metres, and then slew surveillance to the EO sensors for tracking. Once visual confirmation and identification of the drone is made, operators put the target in their crosshairs and pull the trigger, locking onto and automatically tracking the UAS. "The system then puts a 20-degree cone of energy downrange [to] interrupt the signal from the operator to the drone," said Tom Scott, president of US-based LITEYE Systems, who helped create AUDS. The integration of components enables AUDS to defeat a target within 15 seconds of detection. The system is available in fixed-site and deployable configurations, but is not operated on the move. AUDS is used by both civilian and military agencies, and has been deployed with US forces overseas since 2016. The variant used by the US has been customized with additional American-made components by LITEYE to meet specific end-user requirements.

Man-portable directed energy jammers for use by dismounted forces are also in service, including with US forces in the Middle East. Battelle industries' DRONEDEFENDER looks and handles like an assault rifle, but emits electromagnetic (EM) radiation that disrupts the UAS remote control or GPS signal. The weapon operates on standard GPS and ISM radio bands and is designed to neutralise commercially available UAS. The weapon can fire within one second of acquiring the target. The EM is fired in a 30-degree cone of directed energy, wide enough to ensure a "hit" on the moving target, but narrow enough to concentrate the weapon's energy. According to the manufacturer the effect is nearly instantaneous, preventing remote-controlled or automatic detonation of any payload or failsafe system, and severing all video-feedback to the drone-controller. The battery-powered weapon has a 400-metre range and is capable of up to two hours of continuous operation. For point defence, US forces are deploying it in conjunction with the ELTA radar which serves as an early detection system. In 2017 Battelle introduced the second-generation DRONEDEFENDER v2. It features miniaturized electronics to make the weapon less cumbersome, and has only two moving parts, the selector and the trigger.

The Australian-made DRONEGUN operates on the same principle as DRONEDEFENDER. The latest variant, DRONEGUN TACTICAL, was introduced in early 2018. It has an effective range of one kilometre – half the range of previous versions – but is more portable and targets a broader spectrum of frequencies. It can attack multiple targets simultaneously. In addition to radio-control frequencies and GPS it expressly also jams the Russian GLONASS navigation system,

a feature lacking on many other CUAS systems. Like some other jammers, DRONEGUN can scale the effect on the target UAS, optionally triggering the aircraft to return to its point of origin (thereby pinpointing the operator).

Iran has developed its own rifle-shaped jammer which, according to Tehran, can not only disrupt a UAV's command signal, but reprogramme the drone to turn against its owner. A US Army study confirmed the Iranian claims, stating: "Once the device locks onto a drone, its operator is no long-

Photo: Blighter Surveillance Systems



**Tower-mounted variant of the Anti-UAV Defence System (AUDS).**

er in control. It is also reported that it has hacking capabilities, potentially rerouting a targeted drone. Additionally, its hacking abilities may allow the device user to safely land a drone."

## Light and Heat

In the future, not all UAS will be susceptible to RF jamming. For example, the US military is developing autonomously guided unmanned gliders. Autonomously operating UAS that navigate by visual sensors rather than RF or GPS are also approaching operational reality. Potential alternatives to frequency jamming include CUAS lasers and microwave weapons.





**US Army soldiers are using Battelle Industries' DRONEDEFENDER electro-magnetic weapon to defeat terrorist drones in Iraq.**

Lasers can exert varying levels of destruction, depending on the energy output of the beam, and whether the beam targets the UAS sensors ("blinding" but not destroying it) or more vital elements. Effective range is also determined in part by the energy potential.

Numerous lasers have been successfully tested against drones, including the US Navy's 30 kW Laser Weapons System (LaWS) demonstrator. Sea-based evaluation began in 2014 and continues to date. The experimental Stryker-mounted Mobile Expeditionary High Energy Laser (MEHEL) 2.0 has destroyed dozens of UAVs during testing in 2017 and 2018. The weapon has a nominal power of only 5 kW, which was sufficient to destroy small UAVs (hard kill) or to alternately disrupt their control signal, forcing them to the ground for retrieval and exploitation (soft kill). The MEHEL 2.0 system also includes an on-board radar and optical sensors. The Army's goal is a 100 kW tactical air defence laser; to this end, both Lockheed Martin and Raytheon are developing vehicle mounted 100 kW prototypes to be tested in 2022. In the interim the Army is testing a 60 kW Lockheed Martin laser on a heavy tactical truck, and assessing the viability of including a 50 kW laser on the objective Manoeuvre Short-Range Air Defence system which should enter the engineering and manufacturing development phase in 2022. To support light forces Raytheon has mounted a prototype CUAS laser with 1.6 kilometre range on a MRZR dune buggy.

The United States is not alone in pursuing these capabilities. For example, in 2016 the Chinese firm Poly Technologies introduced the 30 kW Low Altitude Guard II truck-mounted laser capable of destroying UAVs

as well as manned helicopters at a range of four kilometres. In 2017 the firm presented an upgraded variant dubbed SILENT HUNTER. Chinese officials claim a power rating between 30 and 100 kW, and the ability to ablate 10mm of steel coating at 800 meters.

Since laser weapons rely on unobstructed sightlines and several seconds of dwell time on target, laser CUAS systems may not be optimal for urban terrain. Microwave weapons offer an alternative approach. They would be capable of firing a broad pulse of microwave energy in the general direction of identified or suspected drones of all sizes and classes. This would enable the weapon to destroy the electronic components of an entire drone swarm with only one pulse; alternately the beam power can be scaled down to "disrupt" flight without destroying the aircraft.

In August 2018 the US Army announced plans to award Lockheed Martin the contract for the Airborne High-Powered Microwave (HPM) CUAS. The HPM CUAS will be mounted on US Army UAVs and enable them to directly neutralize adversary UAVs. Ground-based microwave systems are also being tested. In March of 2018 Raytheon demonstrated a combined microwave and laser weapon system that destroyed 33 drones via a high-powered microwave and twelve per high-energy laser.

## Old Concepts Redefined

In addition to such ultramodern weapons, security forces are also repackaging solutions from decades – and even millennia – past.

In February of 2017 the US Naval War College coordinated the first massed aerial

"dogfight" between swarms of autonomous unmanned aircraft. Each team consisted of ten propeller-driven ZEPHYR UAVs. While the ZEPHYRs were unarmed, they practiced aerial engagement and "scored" when they manoeuvred into a firing position. The test was a concept demonstration, not part of a developmental programme. What type of weapons could be mounted on future CUAS-UAVs was not discussed. Theiss UAV Solutions already offers the (non-lethally) armed EXCIPIO CUAS system. It consists of a high-speed VALIDUS Y-6 UAS which discharges a capture net as it overtakes the target UAV.

Infantry-deployed nets are also an option. British start-up firm Open Works has developed the SKYWALL 100, a man-portable weapon which fires a net to entangle a drone, and the turret-mounted SKYWALL 300. Following capture, a small parachute deploys, gently lowering the captured UAS to the ground for retrieval. The bazooka-like SKYWALL 100 weighs 22 pounds and requires eight seconds to reload. A "smart scope" automatically calculates the drone's distance and vector, providing the operator with the optimal aimpoint. The weapon's range is 100 metres. The man-portable system has only been tested against small rotary UAVs. During Black Dart 2018, SKYWALL 300 successfully took down fixed-wing UAVs as well. At the lower end of the spectrum, SKYNET Mi-5 shotgun shells can be fired from standard 12-gauge firearms. Designed to combat quadcopters, the shell's five tethered segments separate with centrifugal force to unfold a 1.5-metre-wide capture net to trap the drone's propellers.

In February of this year, the US Army reported that its own scientists had patented a CUAS net fired from a standard 40mm grenade launcher, including the under-barrel M203 carried by infantry. The Scalable Effects Net Warhead contains a weighted net which releases when sensors in the grenade detect target proximity. The grenade has a range of several hundred meters, and should be effective even against sophisticated UAVs and drone swarms.

One solution is even more retro. Guard from Above, based in The Hague, and provides site security using trained eagles to intercept intruder drones. Government security agencies form the primary client base. Since 2017 the French Air Force has also been training eagles to protect air bases from terrorist drone intrusions. To protect the animals – which strike their target at 80 kilometres per hour – the military has designed special mittens of leather and kevlar. For their own safety the animals will only be deployed against smaller drones. ■



# Switzerland's Second Attempt

**Georg Mader**

**The renewed Swiss attempt to procure new fighter jets is open to all Western manufacturers. The procurement project will also include long-range surface-to-air missiles (BODLUV). Given a volume of up to CHF8Bn (US\$8.45Bn), the programme will leave its mark on the Swiss Air Force and the Ministry of Defence, but also on Swiss politics and taxpayers.**

In June, the government agency 'armasuisse' will complete the in-country evaluation of the five aircraft contenders. Since the GRIPEN E was rejected on the ballots in 2014, another such referendum will be held, this time ahead of any type decision. Additionally, the Swiss fleet of COUGAR and SUPER-PUMA helicopters will be rejuvenated. And there is a brand-new, government-run business jet carrying the Swiss roundel.

In the past, there have been several incidents when Swiss F-5E and F/A-18C/D aircraft were unavailable for Quick Reaction Alert (QRA) alphas. However, that should change by 2021 in realisation of 'Projekt Luftpolizeidienst 24'. Project LP24 aims at establishing a full 24/7 QRA, making Austria the only European country where no active element is on QRA at night. Moreover, Switzerland has lost half of its precious six F/A-18D two-seaters in crashes.

It was, therefore, a harsh blow to the Swiss AF – then under charismatic Airchief Markus Gygax and Defence Secretary Ueli Maurer – when in May 2014 the Swiss voters rejected the budget for the 22 GRIPEN-E/Fs. Yet, everybody in Switzerland knew that the delay would not be forever. And with international challenges mounting, it was only a matter of time before a new competition would be launched. Guy Parmelin, at the time Head of the Swiss Federal Department of Defence, Civil Protection, and Sports, tasked two panels to deliver a report on the matter and to present options on how to proceed. The 200-page document 'Air2030' listed several options

and the resulting costs for the NKF (Neues Kampfflugzeug) to replace the country's ageing F-5E/Fs TIGER and the F/A-18C/D in service since 1992. It is now a more holistic approach to ensure the best possible future air defence and airspace security for the Swiss Confederation.

Photo: Luftwaffe



**Swiss Air Force HORNETs lined up. Switzerland's HORNET fleet is ageing and in need of modernisation.**

In early 2017, a panel examined possible packages, while the Federal Council opted to pursue a programme worth CHF8Bn (US\$8.45Bn) for approximately 30+ aircraft and a ground-based air defence (GBAD) system. The new programme launched in November 2017 as 'Air2030' aimed to replace both the F-5 and the F-18 in the Swiss AF service. The DDPS also announced that in contrast to the previous botched fighter acquisition, a referendum would be held before any type of equipment is selected. That vote is likely to take place by the spring or summer of 2020, following parliamentary discussions this and early next year. A type selection would then occur in late 2020 or early 2021, leading to an IOC in 2025. The F-5s,

however, will be retired before that time, and the F/A-18s will be phased out gradually when deliveries of the new aircraft start coming in.

## Various Options

The options listed in 'Air2030' and their calculated costs included regaining the lost roles of ground attack and reconnaissance (gone with the retirement of the classics Hawker HUNTER and MIRAGE-III respectively) plus renewal of the ground-based air defence system (GBADS) and radar. The two Swiss panels (one expert and one advisory panel) met 14 times between April 2016 and May 2018, coming up with four different options:

Option 1 foresees the procurement of 55-70 new combat aircraft, in addition to a multi-layered GBADS, which could cover an area of 45,000 sq km and protect 20 sites, for a total cost of CHF15Bn to CHF18Bn, with CHF4Bn allocated to the GBADS.

Under Option 2, Switzerland procures 40 new combat aircraft and a GBADS, which would cover approximately 15,000 sq km. The overall procurement would include the retention of some legacy weapons systems. The cost would be CHF8Bn for the aircraft and CHF1Bn for the GBADS.

Option 3 sees the procurement of 30 new combat aircraft and a multi-layered GBADS covering 45,000 sq km. The existing GBADS would be retained only against low-level threats. Costs would amount to

## Author

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

Photo: RUAG



**The HORNETs are currently being modernised by RUAG.**

CHF6Bn for the aircraft and CHF2-2.5Bn for the GBADS.

Option 4 foresees the procurement of 20 new combat aircraft and a GBADS. Under this option, the service life of the F/A-18C/D would be extended to the early 2030s, and the GBADS would cover 15,000 sq km and focus primarily on threats such as helicopters, unmanned aerial vehicles and combat aircraft. Option 4 would cost CHF4Bn for the aircraft and CHF1Bn for the GBADS.

## Requirements

For the NKF requirement, the Swiss government calls for an aircraft with air defence as its primary mission, but also with the ability to perform strike and reconnaissance missions as a secondary task. The fighter must be interoperable with those employed by neighbouring states and NATO PfP nations, particularly in terms of communications, IFF, and tactical datalinks. Although the Swiss government did not specify an

Swiss pilots. The quotation has to consider total costs based on procurement and operation of the equipment for a total time span of 30 years. The Swiss government clearly calls for an off-the-shelf product, with „No ‘Helvetization’ required beyond minimal adjustments such as integration into the Swiss FLORAKO command and control network. Finally, local assembly of the aircraft is “not a requirement, but is not ruled out.”

On 23 March 2018, the DDPS published the basic requirements for the new NKF and the ground-based part. The document named potential suppliers and established offset requirements. Since the 2008/2009 tender, resulting in nothing following the 2014 referendum, many facts that were controversial or considered crucial at the time have changed fundamentally since then. At that time, it was often said that the GRIPEN-E was the preferred model, but back then the full performance range of the EUROFIGHTER P1E and RAFALE F3 configurations was still years in the future. On the other hand, the proposals related to aircraft projects, which the various manufacturers were able to present at the time. The competitors at that time were evaluated according to what was demonstrated at that time and to what was still in progress, because all three types offered a configuration that was not yet verifiable at that time. The latter has not changed fundamentally.

## Evaluations

Swiss officials say that the unique topography of the country determines their particular needs. While simulation can now answer many of the Swiss customer's questions, and the number of evaluation flights has been reduced from around 20 in 2008 to only seven or eight this year, officials still need to understand how the aircraft's sensors, in particular the radar, deal with the rugged Alpine landscape. Of the seven or eight flights, two will be technical flights and will test the sensors in an alpine environment, according to Kaj-Gunnar Sievert, Spokesperson of the Swiss Defence Agency armasuisse. Five of the flights will be typical for operations of Swiss fighter aircraft such as QRA, Scramble and Intercepts.

Each aircraft candidate had to carry out a total of seven or eight missions with one or two combat aircraft during four flight days in one week. Beforehand, the candidates had the opportunity to familiarise themselves with the specific procedures in Switzerland's narrow airspace by making another flight. One flight had to take place at night. To this end, the take-off times were seasonally adjusted, with flights always

Photo: armasuisse



**A US Navy F-18F at Payerne in April 2019. The type is a contender for Switzerland's procurement programme.**

Reportedly, Option 3 was the most popular among a panel of experts who reviewed the report as it allows for daily air-policing operations, while the extended coverage of the GBADS provides a potential force-multiplier. Option 4 was criticised for its demand for yet another extension of the service life of the old HORNET fleet, especially as Switzerland could be the only HORNET operator towards the end of its planned service life, at which point the jet would no longer have combat effectiveness.

exact fleet size, the fleet should be large enough to maintain four aircraft on patrol for at least four consecutive weeks during periods of tension, while the logistics network must be able to maintain operations for six months – without spare parts supply from abroad. From the outset, the national armaments giant RUAG is named as the preferred centre for maintenance, repair, and overhaul. Another requirement is that an in-country evaluation is to be conducted in Switzerland and – where possible – by

ending before midnight. No test flights were carried out at weekends or on public holidays. Since the F-35 and 'Gripen-E' are only single-seated (the 'Gripen-F' is currently only planned for Brazil), the data collection of the various mission profiles was dependent on company test pilots and the 'armasuisse' recording of all flight test data. On the other platforms, Swiss test pilots supervised from the rear seat of two-seater aircraft.

AIRBUS Defence for the EUROFIGHTER T3, BOEING for F-18E/F SUPER HORNET Block-III, DASSAULT for the RAFALE F3R, LOCKHEED-MARTIN for the F-35A JSF, and SAAB for the latest GRIPEN-E/F have submitted bids and were subsequently invited to demonstrate their aircraft at Payerne. The JAS-39 GRIPEN-E/F still is in validation-tests, like on the SELEX RAVEN radar, prior to serial-production for Brazil and Sweden. Thus, it may again not be able to demonstrate all the features that the Swedes will offer on the type.

When it comes to the F-35 demonstrators, they were sent from Hill AFB in Utah, with stops on the US east coast and Ramstein. Opinion polls show that there is general support for a new fighter, but the F-35 is considered to be too expensive and, above all, as a 'striker' unnecessary for Switzerland.

Newspapers and discussion forums criticised and questioned that although the F-35 JSF would provide military understandable access to the latest data link and signature technologies, it would be unfair to compare it with other fourth-generation jets without considering Russian or Chinese stealth types such as Su-57 or FC-31. The author said on Swiss TV that while it is a nice idea to use such aircraft as sparring partners for Western aircraft, Switzerland's pro-Western and NATO-oriented orientation renders such ideas inappropriate.

Another significant detail: When, on 11 April, a two-seater Eurofighter TYPHOON took off from Payerne to its first evaluation mission, the aircraft did not yet carry an active electronically scanning AESA radar behind the nose radome, nor did the Boeing SUPER HORNETs deployed later. Of course, with the CAPTOR-E there is an E-scan radar in the programme but its demonstrators are IPA5, a UK TYPHOON that has been flying with the AESA-set since July 2016 and IPA8 at Manching as a second asset. However, the latter aircraft was currently unavailable and is in a kind of 'Frankenstein' configuration with P1Ea and the CAPTOR-E. The Swiss were likely better served with a mature operational asset of the P3Ea standard and that was what the RAF deployed to Switzerland, with two full T3 TYPHOONS

## The "Air2030" Programme

At a meeting on 15 May 2019, the Swiss Federal Council decided to continue the "Air2030" programme. The Federal Council instructed the DDPS to submit a draft planning contract for the acquisition of new fighter aircraft by the beginning of September. The acquisition of a new long-range air defence system is not part of this plan but part of the 'normal' procedure. While the Federal Council Decision 2017 provided for the purchase of new combat aircraft and an extensive ground-to-air defence system for CHF8Bn, the decision only covers the combat aircraft component for CHF6Bn, since a smaller volume would jeopardise the size of the fleet requiring a minimum number of aircraft, while a larger volume would not leave sufficient financial leverage for the ground-to-air defence system.

of N°41 Sqn, the RAF Eurofighter test and evaluation unit. P3Ea-standard and CAPTOR-E are completely unrelated, both contractually and from a configuration point of view. Therefore, it was the UK's 'Radar 1+Export Interim Standard' since 'Radar 2' is not yet available. It remains to be seen if Eurofighter gets a chance to demonstrate the CAPTOR-E to the Swiss authorities. The situation might have been different if Eurofighter had not been the first but the last type to be evaluated. With TYHOON production for Kuwait and Qatar now underway, there are some uncertainties as to which of the latest specifications apply to which customers. It seems that, at least in terms of its radar, what Eurofighter demonstrated falls short of the RAFALE and

F-35 because the radar is considered half 'mature'. The current CAPTOR-M, nevertheless, is excellent, which has been confirmed by Austrian AF officers who have gained substantial operational experience since 2007.

Similarly, the offered Block-III of the F/A-18E/F will only feature the APG-79 AESA-radar when the first two aircraft will enter USN troop tests later this year. For flight tests in Switzerland, the aircraft carried a radar-independent and passiveIRST in the front tip of the ventral fuel tank.

Armasuisse will now use the obtained flight test data to confirm the answers to 2,000 questions provided by the manufacturers to the first request for proposals (RFP) issued in July 2018. Several voices have questioned the secrecy with which the initial bids were processed by armasuisse and DDPS. To avoid leaks, the bidding documents were locked away for weeks and fed into a data system disconnected from the internet and accessible to only five individuals. The names are publicly withheld. Similarly, the technical responses are strictly separated from the pricing details and enclosed in separate envelopes. As Mr Sievert explains, no member of the evaluation commission in his segment should be influenced by what that part means for the overall budget.

The data obtained from the flight tests will be used for a direct comparison to support a second RFP planned for 2020. A second referendum, also in 2020, is a possible hurdle for this timetable. Instead of asking whether the government should buy a particular platform, the referendum is likely to be more fundamental, officials say, and will ask whether the country should modernise its air defence system at all. Referendums are one of the most important pillars of Swiss citizenship. For the Swiss, direct democracy is not just about empty words, and such public votes take place several



Photo: Georg Mader

**A Saab GRIPEN NG demonstrator at the Axalp in 2012. In 2014, Swiss citizens rejected the procurement of the GRIPEN in a referendum.**





Photo: Pilatus

**A Swiss Air Force One. Just recently, the Swiss government bought a brand-new PILATUS PC-24 with VIP interiors.**

times a year on many important issues. On the other hand, as we saw in 2014, a referendum on combat aircraft and SAMs can also backfire, as not all voters are experts on the capabilities and costs of military aviation. Switzerland is a stubbornly neutral non-EU country, which for decades has done much more in military terms to live up to its self-chosen status than its like-minded EU neighbour Austria. But here, too, the left-wing pacifist 'Swiss Group without Army' has been collecting signatures, supported by local left-green majorities in almost all major Swiss cities.

## BODLUV

Meanwhile, the so-called BODLUV GBAD requirement is being sought for a ground-based system with a horizontal range of at least 50 km and altitude engagement capability of at least 40,000 feet (12,000 m), with the system's radars contributing to the overall Swiss RAP (recognised air picture). Invited to bid are the Eurosam SAMP/T, RAFAEL's DAVID'S SLING' and Raytheon's PATRIOT in conjunction with Rheinmetall.

Photo: VBS



**Swiss Defence Minister Viola Amherd has once again revised Switzerland's Air2030 programme.**

Currently, Swiss forces are operating RAPIER and STINGER missiles.

Offsets for both requirements were expected in full, divided among direct offsets associated with the purchase (20%), indirect offsets for Switzerland's defence industry (40%) and the remaining 40% for other industries. However, latter part now seems to change. Offsets should be distributed across Swiss regions along the lines of 65% for German-speaking regions, 30% for French and 5% for Italian.

## Stepping on the Brakes

As a result of the complete reshuffling of government functions in the federal executive body every two years, one of Switzerland's two newly elected Federal Councillors, Viola Amherd of the centre-right Christian Democrats (CVP), became the country's first Minister of Defence on 1 January 2019. She succeeds Guy Parmelin of the conservative Swiss People's Party, who had initiated the combined procurement of combat aircraft and GBAD missiles and intended to present the entire package to parliament in February.

However, as often happens when a newcomer wants to leave a footprint, already in the first month, Mme Amherd interfered with the Air2030 programme. At first, she commissioned the well-known and popular former Swiss astronaut, ex-Hawker HUNTER pilot and ex-Swissair captain Claude Nicollier with an outside assessment of the whole matter. He was given until late April to review the entire project, and his 'second opinion' might topple the entire programme. She requested the VBS to come up with yet another analysis of the current threat situation and also tasked Kurt Grüter, Ex-Director of the Swiss Federal audit office (SFAO), with a third outside opinion. Grüter was to investigate the cost of the assumed 100% offset transactions with Swiss industry, as well as the use of

direct and indirect offsets, from a security and economic policy point of view.

All three external reports were presented to the public on 2 May, and this is when Mme. Amherd first explained that she had decided to review the biggest arms procurement programme in modern Swiss history, in an attempt to reduce the risk of yet another negative referendum outcome. Claude Nicollier recommended separating the two contracts and putting only the fighter jet acquisition up for popular vote, yet proposing the acquisition of about 40 aircraft to gradually replace the existing fleet. He also added "With every purchase of fighter aircraft, the idea of leasing comes out of the woodwork. Switzerland has leased 12 TIGER aircraft to Austria in 2004. But the opposite must remain an obvious 'no-go' for an independent and neutral country."

In his report, fiscal expert Kurt Grüter acknowledged Switzerland's efforts to increase the transparency of compensation offsets. However, only direct related cases and indirect compensatory cases relating to the technology and security industry would be relevant. He recommended giving up the other indirect compensatory cases. Given the volume of CHF6Bn to CHF7Bn, a compensation of 100% would be difficult to achieve and might generate higher prices. Cases directly related to the production of the chosen aircraft at the order of 20% and indirect compensatory cases of the order of 40% for the core industry are more realistic, provided that the quality of the industrial programmes is carefully evaluated when comparing the offers. Oscar Schwenk, Chairman of PILATUS Aircraft, said in 2018 that he would increase the price of orders from foreign armies by 15% to 20% when talking about compensation agreements.

Drafted under the guidance of Pálvi Pulli, the DDPS officer responsible for security policy, the threat status report reevaluated the threat scenarios, which formed the basis for the modernisation efforts in the first place. His report confirmed the previous decision that Switzerland was in dire need of sufficient combat aircraft and ground defences to effectively protect Swiss airspace. The negative development of the international security situation in the last two or three years and the time constraints associated with acquisition projects make it all the more urgent to take action.

## Interim HORNET Upgrade

The new developments did not interfere with plans to extend the service-life of the F/A-18s. In spring 2017, Switzerland's 'Army Report 2017' was accepted, in-

cluding a CHF450M agreement to have RUAG upgrade and modernise the HORNET fleet. The aircraft are about to receive upgraded avionics and a new BVR missile. Mr. Salzmann, an armasuisse engineer at ETH Zurich, said that when evaluating the HORNETs in the early 1990s, the experts had underestimated how quickly the jets would show fatigue problems, as operation in small and mountainous airspace would put more strain on the aircraft than over flat land or sea. Mr. Salzmann was unsure whether RUAG would be able to complete the modernisation process in time, as there was a shortage of specialist human resources. Work per aircraft might also easily last up to six months instead of the planned four. Until 2024, the air force could face a limited availability of the type. In 2017, Swiss executives, however, rejected the plan to integrate an air-to-ground capability into the HORNETs. That capability was seen as an option to weigh into the new jet procurement plan. Of course, nowadays all contenders are real multi or swing role fighter jets, with the classic interceptor long since scrapped or in museums of the Cold War.

## Swiss TIGERs for the US Navy

For the next couple of years, the Swiss Air Force will fly a total of 22 F-5E and four F-5F two-seaters, down from a peak of 98 and 12 in 1981. Almost all of them have become the target of a unique item in the US DoD's FY2020 budget as the US Navy wants to acquire another 22 F-5E/Fs from Switzerland to fulfil so-called 'fleet adversary support duties.' The 44 F-5N/Fs that are currently flying as 'aggressors' with two US Navy and one Marine adversary



Photo: Georg Mader

**A Swiss AF COUGAR helicopter, purchased in 1998. RUAG was contracted to upgrade the COUGARs until mid-2022.**



Photo: Georg Mader

**Switzerland's 15 SUPER PUMA transport helicopters were procured in the late 1980s and modernised by RUAG between 2011 and 2014.**

squadrons are also from surplus Swiss Air Force stocks. However, delivery and refurbishment of those jets took place between May 2003 and November 2007 and with the fleet continuing to age, demand for its

services continues to rise. Although some of this demand is being offset by employing private 'Red Air' contractors like ATAC or 'Draken Intl.' for adversary support duties, the Navy will still have to shore up its F-5 force unless it plans to retire the type entirely. Currently, the F-5 – and in particular the Swiss ones because they are very well maintained – still are a sounding economic solution for a range of threat presentations. However, the US Navy will still have to wait a little until the Swiss have procured new aircraft.

## Rotary Modernisation

In December 2018, the Swiss Air Force and armasuisse contracted the Swiss company RUAG to upgrade eight COUGAR transport helicopters until mid-2022. The COUGARs purchased in 1998 are used for transport, search and rescue missions, but the platform's electronic flight control, navigation and communication systems now require major upgrades. The scope of the modernisation includes new flight management com-



Photo: Swiss AF

**The Berne-based VIP transport unit also operates two EUROCOPTER EC 135 with VIP interiors.**



puters, a precision navigation system for IFR flying, a collision avoidance system that alerts pilots to aircraft in critical proximity, and a system developed by RUAG that emits an acoustic signal when the rotorcraft leaves a defined altitude. In March 2019, RUAG Aviation and the Swiss AF selected CMC Electronics business CMC of the Canadian avionics specialist Esterline to supply their CMA-9000 flight-management System (FMS) and CMA-5024 GPS landing-system for the modernisation of these eight Swiss COUGAR helicopters. CMA-9000 supports both military and civil navigation modes and complies to the latest standards for 'Required Navigation Performance' and 'Satellite Based Augmentation System' (RNP/SBAS) approaches, while the CMA-5024 GPS landing system sensor meets the requirements for IFR and civil certified GPS. Its wide-area augmentation system and SBAS GPS capability provide

an accurate navigation solution that supports all flight operations. Modernising the Swiss COUGAR fleet broadens the presence of CMC's solutions within the Swiss Air Force, which also operates 15 SUPER PUMA transport helicopters (procured at the end of the 1980s and already modernised by RUAG between 2011 and 2014) and 20 EC135/635 helicopters. All of them are already equipped with CMC's CMA-9000 and CMA-5024.

RUAG's COUGAR modernisation package also features helmet mounted displays to project important flight data on the pilot's visor, as well as the latest generation of radio equipment and satellite phones, for ensuring safe OPSEC communication. RUAG will also equip the helicopters with the latest IDAS-3 self-defence system, alerting the crew to radar, laser and electro-optical waves, as well as launched missiles. It also includes coun-

termesures, such as dispensing decoys. In addition to the upgrade, RUAG is also tasked with conducting a full structural and mechanical overhaul on the helicopters. Specialists at RUAG will disassemble them, check the relevant parts for wear and tear and repair or replace parts as necessary.

## A New Swiss Air Force One

From its facility at Belp airport to the west of the capital Berne, the Swiss AF operates a small governmental flying service, which recently received a special addition. In a handover-ceremony in Berne, on 18 February 2019, the service took delivery of a single PILATUS PC-24, registered as T-786. The domestic Swiss business jet will replace a CESSNA 560 XL CITATION EXCEL on flights operated on behalf of the Swiss Federal Council (Bundesrat). The Swiss Air Force ordered the aircraft from PILATUS in 2014 for €8.8M. Oscar Schwenk, Chairperson of Pilatus Aircraft, described the latest addition as "the new Swiss Air Force One", saying he is "confident that other governments will adopt the PC-24 once they see the unrivalled opportunities and flexibility which it offers."

Certificated in December 2017, the Williams International FJ44-4A-powered aircraft has a range of 2,000 nm (3,700 km), a cruise speed of 440 kt (810 km/h) and is designed to take off from and land on runways with a length of only 856m (2,810 ft). The 17-metre-long business jet is the only one of its kind that can start and land on short and/or unpaved runways made of sand and gravel. This feature gives the aircraft access to more than 20,000 landing sites around the globe, said Mr. Schwenk, more than twice as many as competing light-jet models.

The Berne-based VIP transport unit also operates a Dassault FALCON 900EX. A BEECHCRAFT-1900 turboprop will, this year, be replaced by two CANADAIR CL604s (T-751 und T-752), which are taken over from REGA MEDEVAC Aviation. And there are two (out of 20 standard configured) EUROCOPTER EC 135 with VIP interiors (T-351 und T-352).

The service's demand for special military transport platforms has not yet been met. As early as 2015, several unsuccessful motions were submitted to parliament to review the rejection of the acquisition of two air bridges in 2004. While ALERIONs (now LEONARDO) C-27J SPARTAN and CASA (now AIRBUS) CN-235 were assessed, the Swiss neutrality principle has prevented any progress.



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Ms. Yaowalak Chuvichien, Senior Sales Manager

+66 (0) 2036 0500 ext 212 Yaowalak@asiandefense.com



+66 (0) 2036 0500

info@asiandefense.com

@DefenseThailand

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# “All candidates will be evaluated according to the same principles.”



## Interview with Bernhard Berset, Chief Test Pilot of armasuisse and Project Leader Evaluation NKF

**ESD:** Mr Berset, what is the subject of Swiss flight testing, what does it cover and what is the focus?

**Berset:** During the test phase, which is part of the regular procedure of a procurement project, the capabilities and characteristics of the combat aircraft are assessed. The basis is the military requirements and the answers to a very long questionnaire, which had to be answered by the manufacturers with the tender. During the flight test, the manufacturer's specifications are checked. The focus is, above all, on the performance of the sensors, their integration into the combat system and presentation of the information to the pilot. In addition, the flight performance and flight characteristics are examined. However, this flight test is only one part of it. Equally important is the verification of logistical and operational aspects, such as the provision of aircraft numbers. Daily operations are a major part of the costs. Prior to the actual flight tests in Switzerland, two-week tests were, therefore, carried out in the simulator in the country of manufacture. Compared to previous evaluations, the number of flight hours flown can be significantly reduced and costs saved. For logistics and operation, product-related audits are also carried out at the manufacturers or air forces of the production countries.

**ESD:** Why are the new fighters tested in Switzerland and not in the producer's country?

**Berset:** Not all tests take place in Switzerland. Important parts of the soil testing and verification in the simulators take place in the country of manufacture because we can perform them there with less effort and better quality.

However, it was a requirement for the producer countries that the actual flight testing must take place in Switzerland. This is the only way to ensure that all candidates have the same test conditions. This enables, for example, the same target presentation or use of the sensors in the same environment and topography. It also ensures that the new systems function in harmony with the existing systems and infrastructures.

**ESD:** What are the biggest challenges during the tests? Are there any risks?

**Berset:** The number of candidates is a challenge. We carefully plan the effort and make sure that the scope and depth of the tests are as comprehensive and efficient as possible. During the entire procurement project, and, thus, also in flight testing, risks are systematically recorded, monitored and, if possible, minimised or eliminated. For example, we schedule reserve blocks for weather-related flight cancellations wherever possible.

**ESD:** How do you ensure that all types are evaluated the same way?

**Berset:** On the one hand, all candidates must complete the same examination programme, while on the other hand, the documentation and evaluation is carried out using precisely defined processes and methods. These activities are carried out by mixed teams of air force, army staff, army

logistics base, command support base and armasuisse with the involvement of all departments.

**ESD:** What is the role of armasuisse? What tasks does the Air Force have?

**Berset:** Basically, armasuisse carries out the evaluation in this procurement phase. However, during the tests, we work as an integrated team. In addition to the organisational units mentioned before, military departments, such as military security, also help with the evaluation. Based on the jointly developed results, the formal responsibility for the general and logistical troop suitability remains with the army staff, the air force or the logistics base of the army and with armasuisse for the 'maturity' of the procurement.

**ESD:** What are your highlights?

**Berset:** To be able to carry out these tests successfully with a motivated and integrated team.

**ESD:** You are the chief test pilot. Will you fly the planes personally? Or who will do it instead of you?

**Berset:** The two-seater candidates will have two Air Force test pilots and two armasuisse test pilots flying together with a manufacturer's test pilot. For bidders with only single-seater fighters, this task is performed by the manufacturer's pilots. They fly exactly according to our mission criteria list and all parameters are, nonetheless, recorded. All candidates are evaluated according to the same principles by Swiss test pilots and flight test engineers. As a sub-project manager for testing, I focus on managing these evaluation activities and leave the actual flying to my colleagues.

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

# Management Issues

**Thomas Withington**

**The command and control of air operations places a premium on connectivity. Having responsive tools and communications to this end is a sine qua non for mission success.**

**T**he numbers speak for themselves. When it is fully deployed, NATO's Air Command and Control System (ACCS) will cover ten million square kilometres of NATO's European territory. ThalesRaytheon-Systems, the consortium that is rolling out the ACCS across all of NATO's European membership (except the UK), states that the ACCS architecture, which comprises

member states will federate a country's disparate ground-based air surveillance radars to form a single, national Recognised Air Picture (RAP). This RAP can in turn be shared with other NATO members and merged into a single 'Super RAP' of NATO's European airspace. It is clear that this will greatly increase the alliance's situational awareness, especially when confronting

sors, principally ground-based air surveillance active and passive radars (see below) and consolidates this into the RAP so that control of this airspace can be exercised. The CAOC, on the other hand, is the 'war fighting' element of the ACCS. This will not only support the command and control of air operations either unilaterally or multilaterally in support of larger joint operations, but it will enable the production of the Air Tasking Order (ATO). The ATO forms NATO's 'sheet music' for air operations. It details all air operations to be performed in a particular theatre over a 24-hour period. This includes all combat air patrols, close air support, battlefield interdiction, tanker and Airborne Early Warning (AEW) orbits, and combat search and rescue coverage to name just five distinct missions. Effectively, the ATO transforms the commander's intent into action.

NATO is procuring four distinct configurations of ACCS: These include ARSs and CAOCs, plus their deployable equivalents (DCAOC and DARS). ARS centres are being rolled out across 12 sites for the first part of the ACCS initiative. These will be received by Belgium, Czech Republic, France, Germany, Greece, Hungary, the Netherlands, Norway, Poland, Portugal, Spain and Turkey. In addition, NATO will receive a fixed CAOC and a deployable system will be built and based at Uedem, western Germany. A DARS has been delivered to NATO as part of this initiative and is based at Nieuw-Milligen airbase in eastern Netherlands. Combined CAOCs and ARS, imaginatively called CARS, have been installed at the Poggio Renatico airbase in northern Italy and at Lyon Mt. Verdun airbase in eastern France. The second phase of the ACCS initiative will see additional ARS centres being installed in Albania, Bulgaria, Croatia, Estonia, Germany, Hungary, Iceland, Latvia, Lithuania, Slovakia, and Romania. Here, the deployable elements of ACCS are particularly interesting. As NATO-led operations in Afghanistan showed, the alliance is no longer called upon to deploy forces exclusively to its own 'back-yard'. Operation Deliberate Force (ODF), the Alliance-led initiative in 1995 to undermine the military potential of Bosnian-Serb forces in Bosnia-Herzegovina, was a wake-up call. Reflecting on the C2 of the "Deliberate Force" air campaign, Colonel Christopher M. Campbell of the US Air Force (writing in Col. Robert Owen's

Photo: US DoD



**The interior of a US Air Force Boeing/Rockwell Collins B-1B LANCER strategic bomber is seen here. Such platforms rely on TDLs to share and receive tactical information.**

an ensemble of software and hardware will be used by the alliance for everything from day-to-day monitoring of national airspace to the planning and execution of high intensity air operations both within and without NATO as a result of its deployable elements. Furthermore, the ACCS infrastructure deployed in each of these

any large scale air offensive developing across much of its territory. Although the contract for the ACCS was signed in 1999, work is still ongoing. As noted, the ACCS will provide a single, scalable suite of hardware and software, which can be tailored to the needs of NATO members and the alliance as a whole. Two main architectures comprise the ACCS concept – The ARS (Air Control Centre, RAP Production Centre and Sensor Fusion Post) and the CAOC (Combined Air Operations Centre). The ARS is designed to support air control to safeguard a country's airspace, or the airspace over a defined area in a deployable context. It receives information from sen-

## Author

**Thomas Withington** is an independent electronic warfare, radar and military communications specialist based in France.

edited volume "Deliberate Force: A Case Study in Effective Air Campaigning") wrote that the CAOC facilities, from which the operation was conducted at Aviano airbase in northern Italy, "did not adequately support planning requirements for a dynamic operation such as Deliberate Force." He continued that "the CAOC lacked a central command facility ... Further, it lacked adequate communications." Fortunately, ODF achieved its strategic goals, although his observations underline just how important satisfactory CAOC facilities are to the conduct of a large-scale air campaign. NATO's possession of a deployable CAOC will ensure that such shortcomings can be avoided in all future operations.

## The Sensors

The sensor integration integral to the ACCS underscores the complexity of the initiative. Up to 48 different types of radar will be linked into the overall architecture. The ACCS software alone includes 12 million lines of code. Taking just one country as an example shows the magnitude of the task. Portugal's Força Aérea Portuguesa (Portuguese Air Force) currently operates eight ground-based air surveillance radars. These include three Hughes/Raytheon HR-3000 HADR S-band (2.3GHz to 2.5GHz/2.7GHz to 3.7GHz) and two Lockheed Martin AN/TPS-44 L-band (1.215GHz to 1.4GHz) ground-based air surveillance radars. Add to this, the radars that the Flyvevåbnet (Royal Danish Air Force) has to integrate. These comprise 24 Thales RAC-3D C-band (5.25GHz to 5.925GHz) deployable ground-based air surveillance radars, which are operated by the Hæren (Danish Army) to provide battlefield air defence, while a single Selex/Leonardo RAT-31S S-band and



Photo: US DoD

**The USAF CAOC at Al Udeid airbase in Doha, Qatar is responsible for managing air operations in the US Central Command's area of operations. Similar NATO facilities are being upgraded through the ACCS initiative.**

eight BAE Systems S-743D MARTELO L-band radars provide national airspace coverage. Beyond the national assets discussed above, the ACCS architecture will have to integrate sensors owned by NATO. These include the two ERA Vera-E passive radars acquired by NATO under a US\$18M deal in 2014 and delivered between 2016 and 2017, plus the two Indra LANZA-LTR-25 L-band ground-based air surveillance radars. Both radars support the deployable elements of the ACCS, notably the DARS. Moreover, ACCS will link not only federate the ground-based air surveillance elements owned by European NATO members, air platforms will be added to the architecture. Whether it is a Armée de l'Air (French Air Force) Dassault RAFALE-B/C equipped with a Thales RBE-2 X-band (8.5GHz to 10.68GHz) fire control radar, or a NATO

Boeing E-3A SENTRY using its Northrop Grumman AN/APY-1 S-band (2.3-2.5/2.7-3.7GHz) AEW radar to watch the skies for potentially hostile aircraft, or to manage the air battle, such information will need to be shared with the ACCS.

## Link-16

This is done using NATO's standard Link-16 Tactical Data Link (TDL) used for the transmission of track and tactical information between aircraft, and between aircraft and ships or ground deployments involved in the air battle like surface-to-air missile batteries. Link-16 uses a waveband of 960 megahertz to 1.215GHz. Compared to civilian telecommunications, the TDL can move a fraction of the data one's smartphone handles at rates between



Photo: NATO

**NATO's E-3A SENTRY aircraft are one of a multitude of platforms that will be connected to the ACCS architecture via the Link-16 TDL.**





Photo: IAI

***The OPAL network developed by IAI has been in service for 15 years and takes an innovative "cloud" approach to managing air operations.***

2.4 kilobits-per-second (kbps) to 16kbps. It is a legacy system, having been in service since the late 1970s/early 1980s. Nonetheless, it shows no signs of retiring and is in as much demand now as ever. The reason for its longevity is quite simply that it does the job. Bart van der Graaf, Thales' Director of Operational Business Development, says that, from an air battle management perspective "Link-16 is still more than sufficient to generate a common operating picture." However, he is now thinking about what could supplement or replace the TDL over the long-term "I would like to move towards a composite tracking network. Every sensor and effector would disseminate their role and track data into a service-oriented architecture network."

The beauty of such a network would be that sensors, platforms and effectors could access this as and when they needed to share data. This would be a step-change from the modus operandi of Link-16. The TDL uses a Time Division Multiple Access (TDMA) approach. In plain English, this is a 'roll call' system. Each Link-16 network includes a central node controlling it and all the participants. The node will ask each participant in sequence if it has any information to transmit to other participants, and will share any information destined for that participant. The node will perform this roll call several times a second covering all of the participants. However, the approach Mr. van der Graaf is promoting would see participants only sharing and

receiving information when they need to. The key difference is that a Link-16 node will consult all of the participants when 'doing its rounds' regardless of whether they have any information to share or receive. The key attraction of Mr. van der Graaf's approach is that it helps to preserve that important commodity in communications, namely bandwidth. He adds that it would enable the network to expand and contract according to its number of participants, again helping to save bandwidth. Mr. van der Graaf is emphatic that the world of air battle management needs to look beyond Link-16 "We have to look at what is coming after. It is about time as this technology is from the 1970s. We have to get away from a TDL mindset and look at a service-oriented approach."

## The Cloud

Israel Aerospace Industries (IAI) have adopted such an approach with its OPAL air battle management system, which it unveiled in April 2019. At the core of OPAL is a communications network, which all participants – be they conventional aircraft, unmanned aerial vehicles, ground vehicles, ships or troops – can access. Participants can then view a common operating picture, which is shared across the OPAL network. Tactical data can be shared too, in much the same way as it is currently with TDLs such as Link-16. One of the interesting attributes of OPAL is that while Link-16 et al can share track data, OPAL can make the full operational environment visible to all participants. One key attraction is that existing communications can be used to access OPAL removing the need to outfit platforms with new radios. IAI shared with the author through a written statement noted that "OPAL relies on a variety communication means and technologies such as radios, satellite communication and even ground Ethernet connectivity."

The network can share a mind-boggling quantity and diversity of information, which "ranges from tactical mission data, platform inventory, video and images, intelligence data and even weather conditions." The architecture is flexible allowing it to easily scale-up or down according to the number of network participants and the information they are sharing "OPAL is highly dynamic and allows for a highly agile operational methodology vs. the somewhat rigid nature of Link 16," IAI continued. Interestingly, IAI does not necessarily see OPAL replacing Link-16 but rather as complementary as it can "extend Link-16 communications to non-Link-16 entities and thus ensure overall force interoperability."





Photo: US DoD

**The Link-16 TDL has been placed in the hands of troops through systems such as Viasat's BATS-D. This is a handheld system allowing soldiers to connect to Link-16 networks.**

This company has taken a leaf from the civilian telecommunications world, particularly regarding smartphones, in its development of OPAL. Once an operating system has been certified for a specific hardware (for example, a specific phone) then new applications can be simply installed without

risking the overall deployment. As this is quite common in the mobile phone market, it is quite unique in the defence arena." It may surprise readers to know that, despite IAI's recent announcement OPAL has been in service for a number of years "OPAL has been operational for more than 15 years

in several armed forces. During this time, it has constantly evolved to include more capabilities and was installed on dozens of different platforms."

Air operations are unlikely to reduce in complexity in the near future. Platforms such as the Lockheed Martin F-35A/B/C LIGHTNING-II are sensor rich and can gather an unprecedented quantity of information. These aircraft, and their other fifth-generation counterparts, will share the skies with a host of other platforms such as UAVs, smart munitions and missiles, which can gather and distribute data. The upshot of this is that a torrent of zeros and ones will be generated that will need to be managed and shared. New architectures such as ACCS highlight the enormity that the challenge of connectivity on such a large scale. For now, air forces can rely on legacy TDLs like Link-16 to carry this information. Future air operations will almost certainly depend upon wider bandwidth and more agile communications to share information to the fullest extent possible. This will ensure that situational awareness and hence 'command and control' is as timely and accurate as possible during air operations moving at the speed of relevance. ■

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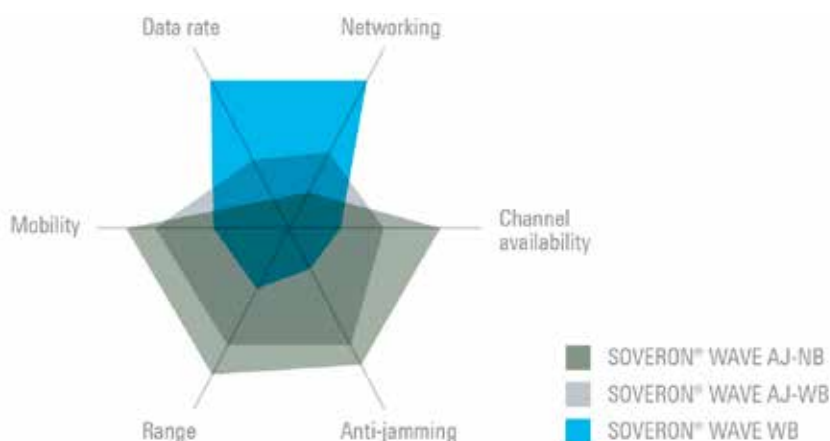
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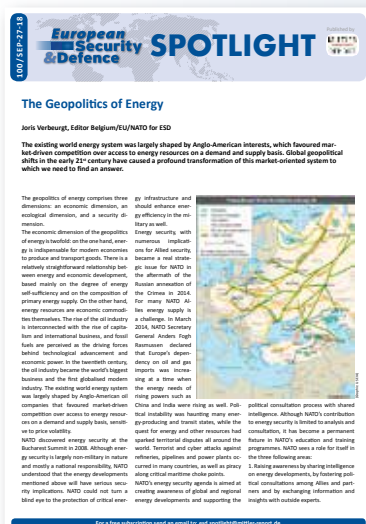
# ESD Spotlight

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# New Horizons in CBRN Decontamination

**Dan Kaszeta**

The threatened use of chemical, biological, radiological, and nuclear (CBRN) materials has not significantly abated in recent years.

One of the reasons such weapons are considered taboo in international law is that many CBRN weapons cause short- or long-term contamination,

CBRN threats, despite the general overall success of arms control treaties. Various UN, NATO, and EU operations keep European militaries, ground forces in

of systems for military (and civilian) decontamination roles. A pillar of their product line is the truck-based MPD 100 heavy decontamination system, which can be configured for any major decontamination task. It can support personnel decontamination up to 120 persons per hour, or it can support vehicle and heavy equipment decontamination. An improved version, the MPD 100i can do up to 240 persons an hour. Decontamination systems are often used to apply generic products, such as bleach or soapy water. But manufacturers put great effort into development of specialty solutions for CBRN decontamination. OWR's own proprietary decontamination solution is GD-6, which is a replacement and improvement on their older GD-5 product. (GD-5 apparently is still on the market in some areas.) GD-6 is notable in that it is meant to be used without water, whereas some rival products are concentrates that are meant to be diluted in water. Since it is useable without water, it is less damaging to sensitive items of equipment. GD-6 was, notably, adopted by the Canadian military as a standard decontaminant and it is now in service with a number of NATO militaries. As a solution for decontaminating chemical and biological threats, GD-6 has proven highly effective in a number of trials and tests. VOP-026, the noted Czech CBRN laboratory has produced a report on use of GD-6 with actual warfare agents and the results, widely available online, are impressive.



Photo: OWR

**Deployment of GD-6 with an MPD-100i Multipurpose Decontamination Container at the Joint CBRN Defence Centre of Excellence in Vyškov, Czech Republic**

which must often be addressed through time-consuming and resource-intensive contamination efforts. Last year (ESD 2018-5) this magazine discussed many of the issues particular to military decontamination.

## Military Decontamination

Military requirements for removal and/or neutralisation of CBRN hazards broadly declined in Europe after the end of the cold war, but have never gone away entirely. There is a continued existence of

particular, in areas where CBRN threats may occur. Gradually, new life has been breathed into the CBRN decontamination arena in the European defence industrial base.

A relatively narrow group of companies dominate the European landscape in military decontamination. Kärcher Futuretech (Germany), Cristanini (Italy), and OWR (Germany) all are significant players in military decontamination. All three provide a full spectrum of decontamination products, systems, and technologies. That two of the three are German firms is a strong reflection of the Bundeswehr having decades of experience taking the CBRN threat seriously, and both had a strong history of supplying German military requirements.

OWR, based in Elztal-Rittersbach in southern Germany, provides a variety

## Civil versus Military Requirements

The main uses of CBRN weapons in recent years have been in civilian or partly civilian environments. These have included brazen air and rocket attacks against civilians in Syria, an assassination in an airport in Malaysia, and the use of "Novichok" agents in the UK. Also, historically, the anthrax terrorism in 2001 in the USA is of significance. All of these show that CBRN terrorism is not just a military problem, but one for civil authorities as well.

## Author

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

As with every other aspect of defence and security, decontamination is not an area where every military product and technology can be converted to civilian use with a coat of green paint, although some vendors have attempted this tactic in the past. Some of the difference is due to the great variety of things that might need decontamination in an urban setting and the need to reduce property damage from use of harsh decontaminating agents. Something useful for decontaminating nerve agent on the side of a tank may be too dangerous to use in residential settings.

Many products designed for personnel decontamination are meant to go onto human skin. However, such products are effectively regulated as medical products if they are going to be used in a civilian environment. The regulatory hurdles are non-trivial and take much time and money for a manufacturer to surmount. For decades there have been products in military service which can be used by soldiers which were simply illegal for use on a civilian terrorism victim. For example, the US Army had a powder-based sorbent skin decontamination kit called the M291, which was legal for military use but of questionable regulatory status on

civilians. However, some positive developments have begun to occur. Emergent BioSolutions (USA) received US Food and Drug Administration approval for their Reactive Skin Decontamination Lotion for civil use.

### New Horizons

In the 1980s and 1990s, there were years when the only tangible improvements in CBRN decontamination were, literally, improved plumbing and better water tanks. Much of this had to do with simple economics. CBRN decontamination has long been a field where cheap generic materials still have some dominance. Specialty products cost far more than generic decontaminants like bleach, soap, water, or the mineral Fuller's Earth. The fact that specialty products were orders of magnitude more expensive than soap and water, but often were only twenty percent more effective at dealing with some contaminants, has been an intractable philosophical problem in CBRN decontamination for decades. The 21st century, so far, has seen number of new products. All of the major manufacturers produce decontamination solutions

(e.g. Kärcher's GDS 2000, Cristanini's BX-24, OWR's GD-6, and the US "Sandia Foam" now made under licence) that are indeed superior to soap and water in many ways. The struggle now, however, is one of economy. Water, bleach, and soap are not any less effective than they were before, and are far cheaper than specialty powders and liquids. Actual CBRN warfare or widespread terrorism will consume a lot of decontamination products, and none of the specialty products are known for being cheap. The next challenge will be to make the same level of effectiveness more affordable to allow acquisition of large stockpiles.

### Fumigation and Large Volume Decontamination

One new horizon is improved fumigation. Fumigation is an old technique for dealing with vermin, such as rodents and insects. As such, it can easily be considered a form of biological decontamination. Fumigating agents, such as ethylene oxide have a long history of such uses in industrial settings. In 2001 and 2002, the gas chlorine dioxide saw much use in the decontamination of

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contaminated offices and mail-handling facilities. However, older fumigating agents pose serious issues. Chlorine dioxide can be dangerous to property while ethylene oxide is a fire and explosion hazard. Neither are particularly good for sensitive items like electronics. Damage to property is a valid concern in building decontamination after a terrorist event. In at least one instance after the anthrax terrorism in the USA in 2001, decontamination forced abandonment as the costs would have exceeded the value of the building. STERIS (USA), known more for its products in the mainstream medical care market, has entered the CBRN marketplace with various systems that use hydrogen peroxide as a fumigating agent. This has shown great promise as vaporised hydrogen peroxide is a reasonably effective chemical and biological decontaminant. Of great note, this method is less destructive of materials, and can decontaminate sensitive items like aircraft electronics or medical equipment. The virtue of STERIS' approach is that it is scalable. Systems could be made as small as a cabinet for small items, and as large as a hangar to decontaminate a tank or a fighter jet. STERIS is not the only player in this segment. Bioquell (UK) pursues hydrogen peroxide-based decontamination as well. It should be noted that this particular market segment is more driven

### A Compact Decontamination Unit

First presented at Eurosatory 2018 and IDEX 2019, the MPDS 2 is Kärcher Futuretech's latest generation of mobile decontamination devices. It provides up to 1,500 litres of cold or hot water per hour, and superheated steam up to 140 °C, the high-pressure pump delivering up to 110 bar. MPDS 2 can be operated with almost all commercially available aqueous and non-aqueous cleaning and decontamination agents, including two-component chemicals. The possibility of three-lance operation allows for simultaneous pre-, main- and post-treatment. With an integrated diesel engine, electric generator, an optional pump for non-aqueous chemicals and two dual injectors within a stackable tubular frame based on the dimensions of a euro pallet, it is an extremely compact, independently usable decontamination unit.



Photo: Kärcher

**The Futuretech MPDS 2 is a new generation decontamination device.**

by hospital sterilisation requirements and that the defence market is a small subset of the overall business of these companies. This is not a detriment to the technical quality. Cristianini (Italy) has similarly pursued decontamination by fumigation. However, they have not pursued hydrogen peroxide. They have fielded a product called LVD-X. This system uses a fine

mist of hydroxyl radicals. One or more of their spray systems can be used to fog an enclosed space, such as a room or a compartment on an aircraft. The properties of the hydroxyl radicals are such that sensitive electronics are unharmed by this fumigation process. The product offering is less extensive than STERIS, but is eminently affordable and is scalable simply by using multiple units. Testing on actual chemical warfare agents occurred at the Czech laboratory VOP-026 and this technology clearly does work to reduce contamination on a variety of surfaces.

### Enzymes and Catalysts

Chemical warfare agents are generally degraded by contact with water in a chemical process known as hydrolysis. If time and water supply were no impediment, water is not a bad decontaminant in itself. However, various tricks can be used to speed up hydrolysis. Some of the older techniques involve raising or lowering the pH of the water with acids or bases. However, this can be quite physically destructive to whatever surface has been contaminated. One way to approach the problem is to find chemical substances that work as "catalysts" which improve the efficiency and effectiveness of hydrolysis or other mechanisms by which chemical warfare agents can be degraded. Many, but by no means all, of these catalysts are enzymes. "Enzymatic decontamination" has been an area of legitimate inquiry since at least the early 1990s.



Photo: DEW

**Vehicle decontamination with foam solutions from DEW**

One commercially available product in this category is DEFENZ, produced by Genencor (USA), a branch of DuPont. The DEFENZ VX-G product works against nerve agents and DEFENZ B-HD is designed to work against Mustard agent. Both can be dissolved into water or foam. The US EPA evaluated these products in 2013 and have published the test results online. Based on reading the 2013 report, it can be fairly stated that these products are good, but still show room for improvement. There are legitimate criticisms to be made in enzymatic and catalytic decontamination. First, these substances are never cheap. Generally, these substances are highly specific to specific threats. For example, there are specific enzymes that work only on the nerve agent Sarin. If you have some other nerve agent, they won't work. Some substances in this family are somewhat more broad-spectrum than others. But if you do not know what exact substance you are dealing with, you might need to throw an entire cocktail of chemicals at the contamination, and end up wasting the enzymes that are not applicable to the problem at hand. In the heat of

battle, very costly goods could end up being washed down the drain. Likewise, a decontamination effort that used the wrong cocktail would only be as good as the water in which the expensive enzymes were dissolved.

### Detection Helps

Decontamination, both in military and civil settings, works best when it is intelligently combined with detection instruments. A "decontaminate everything everywhere" strategy is illogical and not logistically sustainable. Military commanders and civil authorities will be burdened with decisions. Someone needs to decide what actual vehicles, items of equipment, personnel, and areas need to be decontaminated. Detection instrumentation, which has been discussed several times in this publication in past issues, is particularly relevant to this decision-making process.

The area of CBRN detection is one that has historically been full of both inadequacies and many changes to products and technologies. It changes more quickly than the decontamination market segment. However, one of the areas of the detection segment

that is most mature is monitoring of surface contamination for chemical or radiological hazards. Surveying surfaces (such as on an armoured vehicle) for contamination, both prior to decontamination and as a quality control measure after decontamination, is one of the older missions for detection instruments. Many of the current detection instruments stem from technologies originally crafted for contamination monitoring.

One of these technologies is flame ionisation detection (FID). An FID device takes a sample and ionises it using a hydrogen flame. As it turns out, this technique is highly useful for detection of persistent chemical warfare agents on surfaces. Decades of testing with chemical warfare agents shows that FID detection works very well on phosphorus compounds, which includes nerve agents, and sulphur compounds, which includes so-called "Mustard Gas." The only real player in the chemical warfare FID market is Proengin (France). For decades, their AP2C was the industry standard FID device, and it is still marketed by Proengin. It has been supplanted by the AP4C, which is a superior instrument to the AP2C with a broader library of chemical agents that it can detect. Some will make criticisms about these instruments in other ap-



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plications beyond their original design scope. However, in the detection of specific chemical warfare agents on surfaces, such as required by decontamination operations, these instruments give excellent performance. By far the oldest surface contamination de-

low-tech solutions to the problem of locating contamination. This is an area where the specialty Czech firm Oritest has a well-defined market position. Their CALID-3 chemical warfare detection paper sets the standard in this niche.

not accurately function. This means that, in any particular scenario, there will be levels of contamination left after decontamination that cannot be measured. A standard of zero contaminant is therefore technically unrealistic.

Photo: Kärcher Futuretech



**A DSVP 10 C Rapid Response System in action**

tection technique is not actually an area of instrumentation, as it predates handheld electronic detection instruments. One can use colorimetric detection paper to detect the major categories of chemical warfare agents on surfaces. Absorbent strips of paper are treated with specific reagents that change colour when exposed to various categories of chemical warfare agents. Such techniques go back many decades, but are firmly established as highly economic yet

### How Clean is Clean Enough?

A perennial problem in decontamination is one of knowing when to stop. How clean is clean enough? Ideally, the standard would be zero presence of hazard. However desirable this might notional standard might be, it is utopian and is completely unrealistic for a variety of reasons. Every type of detection and measurement instrument has a threshold of detection below which it can-

Since the theoretical level of zero contamination cannot be adequately measured, there needs to be serious discussions of what level of hazard is, therefore, acceptable. This sort of discussion is often difficult, because it involves substances that are inherently dangerous. A rational risk assessment involving military troops and military equipment can easily occur and lead to a reasonable standard for use in military operations. However, such a standard may not be acceptable in civilian settings. Public health considerations and practical politics will likely drive a lower level of acceptable contamination. Further, new threats such as so-called "Novichok" agents have poorly understood human toxicology and there is not the body of knowledge available to allow for a full assessment of what small levels of Novichok contamination might be permissible to remain after decontamination. The problem of "how clean is clean enough" is going to be a philosophical problem in CBRN decontamination for some time to come.

### Conclusions

CBRN decontamination has long been considered one of the more difficult subsegments of the CBRN industry in terms of economics and profitability. When one's competing technology is essentially free (water), it can be hard to make a good business case that a particular product or system is worthy of investment. However, new and interesting technologies and products continue to emerge in this segment. ■

Photo: Wikimedia Commons



**Decontamination works best when it is intelligently supported by detection instruments. Shown here is an AP2C-V chemical agent detector from Proengin mounted on a NBC reconnaissance vehicle of the Japan Ground Self-Defence Force.**



# ASELSAN – a High-Growth Company with Global Potential



**With an expanding global footprint, Turkish technology conglomerate ASELSAN cultivates economic growth. ESD had the opportunity to talk to Osman Devrim Fidancı, Vice President Business Development and Marketing at ASELSAN**

**ESD:** What is ASELSAN's mission strategy and its global positioning in the world markets?

**Fidancı:** ASELSAN currently offers several hundred products and services under the five divisions operating worldwide. The divisions consist of "Communications and Information Technologies", "Defence Systems Technologies", "Microelectronics, Guidance & Electro-Optics", "Radar and Electronic Warfare Systems" and "Transportation, Security, Energy and Automation Systems".

ASELSAN develops technologies and products both at home and abroad in defence as well as non-defence markets. In line with the company's motto "Technology Serving People & the Planet", we recognise that commercial markets are a key part of the future and ASELSAN's technological know-how.

ASELSAN's technological understanding is based on three basic principles: first, the "Improvement of Current Technologies", second the "Development of New Technologies and Products" and third, the "Development of Core Technologies / Technology Creation". As a technology company, we pay particular attention to disruptive technologies and the digitalization of the technological landscape, which includes Artificial Intelligence, Swarm, Deep Learning, Machine Learning, Virtual Reality and Sensor Technologies.

Investing in employees is a fundamental aspect for ASELSAN and the company has become the most preferred technol-

ogy company among engineers in Turkey. Of our app. 7,000 employees, app. 4,000 team members are engineers working in research, product development, integration and testing. As an engineering oriented high technology company, we see ourselves as a large educational institution for engineers, where they can prepare themselves with key competencies for current technologies and improve their skills for designing and developing future technologies.

We continue to improve robust and sustainable corporate growth in our home country, and in foreign markets through mergers, acquisitions and investments as well. With more than 20 subsidiaries, our global footprint continues to expand - both in the local and international market, including countries such as South Africa, Azerbaijan, Indonesia, Kazakhstan, Malaysia and Jordan. In February of this year, we also acquired 51% of the shares of a future promising Ankara headquartered software company BITES AS. This enabled us to further expand our strategic orientation in the areas of software development, geospatial intelligence, augmented & virtual reality applications and training/simulation technologies as well.

**ESD:** What added value is behind the collaborative and cooperative approach of "Transfer of Technology" for ASELSAN's customers?

**Fidancı:** We share our state-of-the-art technology and expertise with allied countries, especially those in the various stages of development. We respect the countries that are striving to build their own defence and technology industries while we are optimizing competence capabilities within these respective markets by introducing the new technologies that we are continuously developing. We consider the Transfer of Technology to be a process that allows nations to build their own technological capability based on the infrastructure that we build, it is a process that enables them to be able to

develop their own core technologies in very near future and to gain their home-grown technology development capability. Localisation, which comes with local manufacturing, is another tool that we utilise as we serve nations in line with our conviction to create innovative "Technology Serving People and Planet." Localisation also leads to economic, technological and the educational growth of a nations via the increase in employment, establishment of new production facilities and the training of employees. In addition to these examples, we are proud to see that ASELSAN's experience and know how is spreading all over the world through our successful collaborations and cooperative partnerships.

**ESD:** ASELSAN will be exhibiting at the Paris Air Show in June this year. What are ASELSAN's aims in France?

**Fidancı:** From 17 June to 23 June we will exhibit our innovative competencies and solutions at the Paris Air Show, but more importantly we will meet with our partners and clients so that we can shape the future product & solution roadmap. At the Paris Air Show ASELSAN will proudly demonstrate its proven, complete and comprehensive set of solution at its booth. We have gained valuable experience with various international foreign air forces through the contracts and co-operations and we are now willing to showcase our achievements to our international clients and partners once again. For instance, we can take over a General Utility Aircraft and convert this high technology platform into a Special Mission Aircraft, according to the requirements of the customer, missionising the aircraft according to its concept of use. The Special Mission Aircrafts are typically equipped with the cutting-edge avionic systems and sensors in order to conduct pre-planned missions accordingly.

**The Interview was conducted by Korhan Özkilinc**

# The Serbian Alternative

## Developing Defence Export Momentum

**David Saw**

**The Serbian government sees its defence industry as a strategic national asset that it wishes to sustain and grow.**

I ncreasing defence exports helps to sustain the defence industry and also brings in foreign currency, which boosts the Serbian economy. The defence industry also presents a means of attracting Foreign Direct Investment.

Across the course of the nineteenth century, Serbia struggled to free itself from the shackles of the Ottoman Empire. This

clauses on Serbian autonomy. By the end of the 1860s, the last Ottoman presence on Serbian territory had been removed, and under the terms of the Treaty of Berlin, in July 1878, the great powers of the time gave official recognition of Serbia as an independent country. This was followed in 1882 by the establishment of the Kingdom of Serbia.

Bulgaria in 1885, this was just the overture to a much larger set of conflicts known as the Balkan Wars. The first Balkan war commenced in 1912 when the Balkan League comprising of Bulgaria, Greece, Montenegro and Serbia sought to take advantage of instability in the Ottoman Empire to grow their own territory and liberate those of the same ethnicity from Ottoman rule. They



Photo: Ministry of Defence, Serbia

**The Defence of Freedom parade in Nis, held to celebrate Victory Day in May, saw the Serbian Army display 51 M-84 tanks. The M-84 sale to Kuwait at the start of the 1990s was the last major export sale of the Yugoslav defence industry. Today's Serbian defence industry continues to break records with sales of US\$897M in 2018.**

saw the emergence of the Principality of Serbia and its de facto recognition as a political entity from the end of the 1820s. The Principality of Serbia also established a small army. Achieved through the Treaty of Adrianople, which was imposed by Russia on the Ottomans in 1829, and included

One of the best illustrations of the level of autonomy that the Principality of Serbia had achieved and the fading of Ottoman power was the launch of production at the Kragujevac Cannon Foundry in 1853. The city of Kragujevac had become the centre of industrialisation in Serbia from the mid-1830s onwards and is now Serbia's fourth largest city. As to the cannon foundry, it is considered to be the legacy organisation of Zastava Arms, currently one of the most important defence industrial enterprises in Serbia.

Having a defence industrial capability would prove to be important to Serbia, as from the 1880s onwards it would be embroiled in a host of conflicts in the Balkans. Although there was a short war against

were successful in this and by May 1913 and the signature of the Treaty of London, the vast majority of Ottoman territory in Europe had been conquered.

The month after the signature of the Treaty of London, the second Balkan War broke out, with Greece, Montenegro, Romania and Serbia, supported ironically by the Ottoman Empire, taking on Bulgaria. By the time the war ended in July 1913, Bulgaria had lost most of its gains from the first Balkan War, the Ottomans had regained some territory and everybody else kept what they had and/or gained a bit more. From the Serbian perspective, they had increased their territory and their military was effective and battle tested. A little over a year later, the First World War broke out and

### 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.



while eventually Serbia would emerge on the victorious side, the human cost was immense. The country had been fought over and occupied and the physical damage was enormous, with infrastructure and industry, including the defence industry, needing to be rebuilt.

The territorial settlements at the end of the First World War imposed a new reality on the Balkans. Serbia absorbed the Kingdom of Montenegro and then Slovenia and Croatia, becoming Kingdom of Serbs, Croats and Slovenes in December 1918. In December 1929, country was renamed as the Kingdom of Yugoslavia. Strategically, Yugoslavia saw itself as more than just a Balkan state and had ambitions to be a maritime power in the Aegean and the Mediterranean.

The national defence industry was rebuilt post-1918 and its spectrum was gradually expanded to include the construction of small naval vessels. There was also investment into aircraft and related industries, through the establishment of companies such as Ikarus in Novi Sad, Vojvodina. Ikarus was established in 1923 to manufacture aircraft, aero engines and engines for cars, trucks and buses (the company still exists today as a bus manufacturer). It later expanded into aircraft manufacture, being responsible for the local assembly of foreign fighter and bomber aircraft. Later, it would design and build its own indigenous fighter aircraft. Yugoslavia also had other aircraft manufacturers building trainers and float planes. Rogožarski designed the advanced IK-3 fighter that was being adopted by the Royal Yugoslav Air Force on the outbreak of war in 1941.

Once again, war would devastate Yugoslavia and would also mark the end of the royalist state that was superseded in November 1945 by the Socialist Federal Republic of Yugoslavia (SFRY) under the leadership of Marshall Josip Broz Tito. The new Yugoslav Army had been established in March 1945 and this would be renamed as the Jugoslovenska narodna armija (JNA) in December 1951. The JNA was a tri-service organisation covering ground, air and naval forces.

## Building the Base

It had been assumed that the SFRY would align itself politically with Stalin and the Soviet Union. Initially, this was the case but in 1948 Tito broke relations with Stalin and determined to forge an independent direction in foreign, economic and social policy. Relations between the SFRY and the USSR would be restored in 1955, but by that time Tito had determined that the best



Photo: Ministry of Defence Serbia

***Serbian Army NORA B-52 155mm self-propelled howitzer systems on display at the Victory Day parade in Nis in May 2019. The NORA system continues the tradition of export success for Serbian artillery systems, having been acquired by Bangladesh and Kenya amongst others.***



Photo: Ministry of Defence, Serbia

***The Advanced Light Attack System (ALAS) is a missile system originally developed for the Serbian military in two variants: ALAS-A with a 25 km range and ALAS-B with a 60 km range. The third variant, ALAS-C, was developed as part of the military cooperation arrangement with the UAE to be used for coastal defence applications.***

course for the SFRY was to steer a course between the two superpowers (the US and the USSR), achieving maximum concessions from the both the East and the West. One of the first tasks for the Tito government was to rebuild a shattered country and its industrial infrastructure. One immediate bonus from breaking with the USSR was the arrival of US economic aid. This would assist the SFRY in its reconstruction, an important part of which was re-establishing the national defence industry. It was obvious that if the SFRY was to follow an independent

strategic direction, it would need to meet as many of its defence requirements as possible from indigenous resources.

The importance of a domestic defence industry was made plain after the split with the USSR. At that point, most of the primary combat aircraft in service with the Yugoslav Air Force were of Soviet origin and after the break with the Soviets no spares or other support was forthcoming. This created a need for new combat aircraft and the domestic industry responded. Ikarus used the design of the Rogožarski



IK-3 as the basis to design a new fighter known as the S-49A. Work commenced in 1948 on the aircraft. The first flight was in mid-1949 and deliveries commenced in 1950. The improved S-49C variant arrived in 1952 and this remained in service until 1961. Over 150 S-49 aircraft were built by Ikarus for the Yugoslav Air Force.

There was also a requirement to sustain the legacy equipment being used by the Yugoslav military. This led to the development of an industrial base to support the extremely diverse selection of equipment present in the country. Echoes of this support for legacy equipment can still be seen in the eclectic range of small arms ammunition currently offered by Prvi Partizan in Uzice, Serbia, from the pre-1914 standard rifle rounds of Austria-Hungary and France, to the 6.5mm Grendel and .338 Lapua Magnum of today. The breadth of the Prvi Partizan ammunition range allied to its quality puts the Serbian company in a unique position to meet the needs of military, law enforcement and civilian shooters. Added to which, their ammunition range is a good value proposition as well.

legacy equipment, but also led to Yugoslavia developing its own equipment solutions based on these legacy designs.

During the partisan era, Tito's forces were supplied with both UK and US equipment and much of this remained in service post-1945. The break in relations with the USSR saw Yugoslavia turn to the UK and US for military assistance, and, due to Yugoslavia's strategic position, this assistance was forthcoming. British aid included surplus combat aircraft, helicopters and naval units. However, it was US military assistance that would be critical in re-shaping the JNA in the 1950s. Military equipment supplied included armour, artillery, combat aircraft, transport aircraft, plus radars and gun systems for a destroyer built in Yugoslavia. It is important to note that the US equipment supplied to Yugoslavia in the 1950s was essentially the same as that supplied to allied states in NATO, illustrating the importance of Yugoslavia at that time.

Although relations with the USSR improved from the mid-1950s onwards, it was only from the early 1960s that equipment was

## Export Direction

NAM also helped to provide Yugoslavia with an export marketplace for its defence industry and a means of selling surplus equipment to Cambodia, Cyprus, Egypt, Ethiopia and Honduras amongst others from the late 1950s to the end of the 1970s. In terms of Yugoslavian-produced equipment, it should be noted that systems for ground, air and naval applications were successfully exported. Clients for naval equipment included Bangladesh, Ethiopia, Indonesia, Iraq, Libya, Myanmar and Sudan. In terms of air systems, the SOKO GALEB jet trainer was exported to Libya, Myanmar and Zambia, while the SOKO JASTREB light attack aircraft was exported to Libya and Zambia.

Ground systems were a particularly strong area for the Yugoslavian industry, with the sale of the M-84 tank to Kuwait at the end of the 1980s being the most notable contract. The M-84 tank was a licensed produced version of the Soviet T-72 with significant improvements to firepower, protection and mobility characteristics to meet JNA requirements. The Kuwaiti contract, signed in 1989, covered the supply of 170 M-84AB tanks, 15 M-84ABK command tanks and 15 M84AI ARVs (a licensed produced version of the Polish WZT-3 ARV). A few tanks had been supplied prior to the Iraqi invasion of Kuwait, but the majority were supplied to exiled Kuwaiti military forces in Saudi Arabia prior to the liberation of Kuwait in 1991.

Artillery and mortar systems were successfully exported. These included the M56/M56A1 105mm howitzer that was exported to Bangladesh, Cyprus, El Salvador, Guatemala, Indonesia, Nigeria and Peru amongst others. El Salvador and Myanmar received 120mm mortar systems, while Azerbaijan, Cyprus and Georgia are reported to have received 128mm OGANJ and PLAMEN multiple rocket systems.

## New Beginning

In June 2006, an independent Serbia emerged, but this new state was in a highly vulnerable economic and strategic position. This is hardly surprising when one considers that the 1990s had seen the collapse of Yugoslavia, the end of the JNA and a brutal conflict amongst the former components of the SFRY. Then, in 1999, came the NATO bombing of Serbia, striking military as well as infrastructure and industrial targets. It was vital for Serbia to recover and rebuild. As a part of this recovery process, Serbia sought to develop a military structure that the new country could sustain and deter-

Photo: Ministry of Defence, Serbia



**The locally designed and produced LAZAR III wheeled armoured vehicle on parade at Nis. The Serbian Gendarmery operates the vehicle, while the Serbian Army is in the process of procuring a large number of LAZAR III systems. The vehicle will be fitted with different RCWS options depending on the mission requirement.**

Post-1945, Yugoslav military found itself with equipment drawn from multiple sources, including from the pre-1941 royalist era. Then came a vast quantity of Axis equipment captured in 1945, much of which remained in service for many years. To which was added equipment gained as reparations post-1945 and machine tooling and technical data also gained as reparations. This allowed for the support of this

acquired from this source. Another important development was the foundation of the Non-Aligned Movement (NAM). This was established in September 1961 at a conference in Belgrade, with Yugoslavia as a prime mover, along with India. Its leading role in NAM allowed Yugoslavia to continue to navigate between the two superpowers, seeking the most advantageous terms from either side.

mined that an effective defence industrial base was a key asset for national defence. The defence industry of the former Yugoslavia had been located all over the country, but with the collapse of the Yugoslav state, the integrated defence industry that had served it and the JNA disappeared. The end result was that Serbia would build its new defence industrial base upon the former Yugoslav capabilities that were within Serbian territory and would add to these capabilities as time and resources allowed. Having a competent defence industrial base was more significant than just meeting Serbia's defence equipment needs. It also had important economic consequences. In the Yugoslav era, the defence industry was the key national export industry with only tourism coming close as a source of foreign currency. Serbia's aim was to have its defence industry make an equally positive contribution to its national economy. Another important factor is that a credible defence industry provides international visibility and this translates into the ability to obtain influence internationally, plus the ability to obtain more tangible economic benefits such as Foreign Direct Investment (FDI).

It would be fair to assume that Serbia's defence industrial capabilities were a key factor leading the extensive investment into the Serbian economy by the United Arab Emirates (UAE). From 2013 onwards, the UAE has invested heavily in Serbia in such areas as agriculture, aviation, defence, as well as in renewable energy, semi-conductors and telecommunications. This FDI came at a time when the Serbian economy was under intense pressure and made an important contribution to economic stabilisation. This was further assisted by a US\$1Bn low-interest loan granted to Serbia by the Abu Dhabi Investment Authority in 2014.

Apart from assisting the broader national economy, these economic links with the UAE would have positive implications for the Serbian defence industry. In 2014, Serbia signed a military co-operation agreement with the UAE that would cover exchanges of information and defence technology between both countries. Additionally, the UAE military personnel would train in Serbia. For Serbian industry, the most important facet of the agreement was that the UAE would fund weapon developments in Serbia. An example of this is the Advanced Light Attack System (ALAS), a missile programme that was under development for the Serbian military. Here, the UAE funded the development and fielding of the ALAS-C variant of the missile system to meet its needs for a coastal defence missile system. The UAE remains an important market for the Serbian industry.

## Industrial Growth

In April 2019, the Serbian government announced that Serbian defence exports for 2018 amounted to US\$897M; this was a major boost on the defence sales figure for 2017, which came to US\$570M. One factor given for this sales growth was an increase in demand for firearms and ammunition. The government reported that the largest number of export sales permits were grant-

It is important to note how competitive the Serbian industry is. This is illustrated by the case of Bangladesh. Bangladesh is one of the largest defence exports markets for China, whose immense defence industry ought to be able to supply any conceivable Bangladeshi defence requirement. Furthermore, the financial packages to support equipment acquisition that China can offer a key customer such as Bangladesh are virtually unbeatable. And yet, Serbia was able



Photo: Ministry of Defence, Serbia

***The PEGAZ 011 UAV system was displayed at the Victory Day parade in Nis. This is a medium-range tactical UAV for day and night missions, with an armed variant developed more recently. Although Serbia has purchased Israeli UAVs and intends to buy UAV systems from China, locally UAV development will be sustained.***

ed for sales to Saudi Arabia, the UAE and the United States. Other important export destination destinations were Belgium, Bulgaria, Cyprus, Germany and Romania according to government reports. Serbian Defence Minister Aleksandar Vulin noted in May 2018 that Serbian defence exports had quadrupled between 2012 and 2017. The 2018 figures confirmed the continuing upward trend in defence exports.

While demand for Serbian small arms and ammunition, plus grenade launchers and 60/80/82mm mortars has been highly lucrative for the industry, the sale of higher value and more complex equipment should not be ignored either. Artillery systems such as the NORA-B52 155mm self-propelled gun system, the OGANJ multiple rocket system, 120mm mortars, armoured vehicles, training aircraft and missiles have all been exported. Customers in recent years include Bangladesh, Cameroon, Democratic Republic of the Congo, Iraq, Kenya and Nigeria. Surplus Serbian equipment such as artillery and tanks has also been sold to Cambodia and Ethiopia.

to sell advanced artillery systems to Bangladesh beating off Chinese competition.

There is no reason why Serbian defence exports cannot continue their upward trajectory. A decline in demand for small arms, ammunition and related systems would appear to be unlikely in their core export markets. What would be useful is FDI and joint ventures with the defence industry to allow investment in terms of R&D and products. The Serbian government has indicated that it would allow FDI and joint ventures, but that Serbia would retain a 51% shareholding in these joint ventures.

As to the future of the Serbian defence industry, much will depend on the political course chosen by the government. Will they look to follow their regional neighbours into the embrace of the EU, or will they look towards Moscow as their strategic partner? The choice of future strategic direction will inevitably have an impact on defence industry developments. In the meantime, the defence industry will continue to be a prized economic asset for Serbia. ■





# “We are redefining aerospace.”

**Interview with Tael Kamel,  
Vice President MEA, Collins Aerospace**

**ESD:** You were appointed as Vice President of Collins Aerospace for the Middle East, Turkey, and Africa a few months ago. What is your strategic vision for the company towards these markets?

**Kamel:** Collins Aerospace has brought together two of the most innovative players in the industry – UTC Aerospace Systems and Rockwell Collins. In terms of our regional strategy, we would like to renew our commitment to the Middle-East region in line with the economic diversification policies expressed, for example, in the "Vision 2030" plan of the Kingdom of Saudi Arabia

and to train local talent. Above that we will continue our established and significant collaboration with academia, for example Khalifa University in the UAE

**ESD:** The product and service portfolio of Collins Aerospace is widespread – in both the civilian and the defence markets. You offer solutions in the fields of communications, avionics, electronic systems, navigation, optronics, targeting, electronic warfare, simulation and training, to name only a few. What synergies can be generated from a portfolio like this, especially for the defence market?

**Kamel:** We have not even concluded the first half year after the merger, and we are already uncovering very nice synergies between our product portfolios. I will, for example, mention Mission Systems. We have now ejection seats as part of our portfolio – and that complements perfectly the avionics suite we

**Kamel:** In the Middle East obviously the UAE is an important market for us as well as the Kingdom of Saudi Arabia. And in Africa, we have very promising market growth, in North Africa as well as in the sub-Saharan region, including South Africa

**ESD:** What is your message for the Turkish customer?

**Kamel:** We have enjoyed a long-standing relationship with Turkish customers. More than 20 years ago, we started collaborating with TAI, Aselsan, and other major players in the Turkish industry, and our collaboration has become stronger over the years. Now, we would like to manifest this collaboration on the occasion of current Turkish Air Force programmes, particularly the TF-X national combat fighter aircraft and the T-X HURJET future jet trainer.

**ESD:** What do you offer the civil security forces in the MEA market?

**Kamel:** We have a lot of innovative products of interest for the regions I am dealing with. I would like to mention the PSR-500, which is an example of perimeter surveillance very much suited to protect critical assets from intrusions or from non-legal interference.

**ESD:** What benefits do your customers get from the merger of UTC Aerospace and Rockwell Collins?

**Kamel:** Imagine, you bring together the best talents from secure communications, avionics, ejection seats, sensors and many others, and a team of 70,000 highly skilled employees, including an engineering workforce of more than 16,000. This generates powerful performance, in line with our statement "We are redefining aerospace." Our customers will benefit from a large portfolio of products and services, our ability to drive aerospace technical innovation and to provide world class aftermarket support. And, not least, they will benefit from the financial strength of UTC which enables us to push more R&D and therefore to bring more innovative products to the market in a shorter amount of time.

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

Photos: Collins Aerospace



**The PSR-500 perimeter surveillance radar system from Collins Aerospace is suitable for locations such as airports, industrial and military sites and public or private urban sites.**

and the "Tomorrow 2021" plan revealed by the Crown Prince of Abu Dhabi last year. Thus it was very exciting for me to be at IDEX for the first time under the banner of Collins Aerospace last February. We have forged successful partnerships in all the regions I am responsible for. Our strategy is to continue to invest locally, to support the regional industry in line with their respective policies, to develop new partnerships

offer and our communications systems. Thus, we are able to provide much more content - intelligent content - to our customers than before: innovative defence solutions aimed at fully connecting the battlespace, sensors generating data to be leveraged to better manage the operational challenges.

**ESD:** What are the key markets you will focus on?



# Joint Fires in South Africa

**Gerhard Heiming**

In late March 2019, Rheinmetall and its South African subsidiary Rheinmetall Denel Munition (RDM) demonstrated the capabilities of their ammunition to around 800 customers and prospects from 53 countries at the Denel Overberg test site in the South African province of the Western Cape.

This was the third time that RDM hosted the Munition Capability Demonstration (ACD). An exhibition with products of the organisers and partners as well as a series of lectures on ammunition concepts and development lines were the background. The highlight of the ACD, a demonstration of live ammunition, supported by the South African Defence Forces (SANDF) under the leadership of Lt-Gen Lindile Yam, Chief of Staff. SANDF provided the weapon systems from which the ammunition was fired by the personnel.

At the beginning of the night and day shooting campaigns, RDF personnel technically described each type of ammunition and demonstrated it in single shots, followed by the demonstration of the ammunition during the interaction of forces under tactical operating conditions. The demonstration included SANDF fielded weapon systems with the appropriate ammunition as well as systems intended for introduction (such as the T5-52 howitzer and ammunition at the end of its development phase).

## Ammunition in a Tactical Environment

The Luftwaffe launched night shooting with two GRIPEN D and HAWK Mk 120 fighter aircraft, which fought the enemy with bombs and guns, supported at a medium distance by ROOIVALK Mk I attack helicopters with 70mm rockets as well as on-board cannons and heavy machine guns.

Then the artillery took over the fire fight with pulled howitzers G5 and 6x6 self-propelled guns G6 and suppressed the enemy with 155mm shells. The artillery was supported by the navy with a 76mm cannon from Oto Melara. According to the 'integrated fire plan' the advancing enemy forces were fought at medium distance with ROOIKAT reconnaissance tanks and 76mm ammunition and OLIFANT tanks with 105mm ammunition.

The last combat phase began with the RA-Tel infantry fighting vehicle with 20mm and 90mm cannons in conjunction with 60mm and 81mm mortars before the

Photos: Heiming



**MISSION MASTER protection and rescue in convoy**

infantry with small arms from R4 assault rifles, machine guns, and 40mm grenade launchers repelled the last enemy forces at close range. In this phase, illumination ammunition supported reconnaissance at various distances. The end was marked

by fire with 107mm (type 63 MRL) and 127mm (6x6 BATELEUR) rockets.

The GRIPEN D, HAWK Mk 120 and ROOIVALK initiated daytime shooting with bombs and missiles. The ensuing firefight saw howitzers G5 and G6, with 155mm

## The Denel Overberg Test Range

The Denel Overberg Test Range is a subsidiary of Denel and operates a 430 square kilometre training area near the southern tip of the African continent. The fully secured area consists of two up to 14 km wide sectors and offers fully instrumented facilities for testing flight systems and modern guided weapons with a variety of different target configurations. The De Hoop nature reserve between the sectors can be included in the security zone. This results in a maximum firing distance of 70 km including the front south-east sea area. The Mediterranean climate allows year-round testing with little climatic variation.



Graphic: RDM

**The 430 sq km Overberg test site on the Indian Ocean**



**Selection of 60mm, 81mm and 120mm mortar ammunition from RDM**

explosive and splinter shells, as well as dismounted mortars and mortars mounted on RATEL and BADGER combat vehicles in 60mm, 81mm and 120mm calibres engage the enemy columns.

This is where the new 60mm (insensitive) mortar cartridges of the PATROL insensitive high explosive series (IHE) were demonstrated, the variant with preformed fragments (PFF) of which is on its way to qualification at RDM. The PATROL cartridges are optimised for command and special mortars and can be fired from mortars with tube lengths between 895 mm and 1,450 mm.

Insensitive ammunition will only explode if triggered by a detonator. In the case of bombardments or explosions in the immediate vicinity, the explosives can at most deflagrate (decay) without significantly affecting the surroundings. With PFF, a uniformly high effect is achieved in the target area.

INGWE and UMKHONTO armoured vehicles with anti-tank missiles cordoned off the area. Meanwhile, the PLOFADDER mine-clearing system created a minefield lane, which allowed battle tanks and infantry fighting vehicles to advance. A rocket pulled 300 kg of explosives over the minefield and distributed them in such a way as to create a wide and safe lane for the combat vehicles after bursting. After artillery and combat helicopters prepared the ground, the combat troops cleared the location with RATEL, ROOIKAT and OLIFANT vehicles.

Enemy forces that had broken through had been defeated by defensive fire from infantry and Special Forces (the effect of which is described below in relation to the mission master).

This was preceded by an extensive demonstration of explosive ordnance for the infantry. The focus was on 40mm ammunition, which can be fired from various grenade launchers. Grenades with low (LV), medium

(MV) and high (HV) velocity cover a range from 300 m to 1,000 m. In addition to explosive/splitter ammunition, several types of smoke and signal ammunition are also available.

As with the night shootings before, the BATELEUR and Type 63 multiple rocket launchers were the eye-catching final items in the demonstration. The firing and flying noises of the salvos of 40 (BATELEUR) and 12 rockets alone gave an impression of the effect in the target area.

## World Premiere: MISSION MASTER in Hot Shot

In addition to the many weapon systems in the South African army, the unmanned ground vehicle MISSION MASTER (MM UGV) was presented for the first time as

### Rheinmetall Denel Munition

In 2008, Rheinmetall Waffe Munition (RWM) established the Rheinmetall Denel Munition (RDM) joint venture with the South African state-owned Denel, of which Rheinmetall has a 51% stake. RDM pools Denel's expertise in the development, design and production of ammunition. Two-thirds of the ammunition is produced for land systems with a focus on artillery and mortars while the remainder is for air and naval forces. While RWM mainly supplies NATO countries, RDM concentrates on South Africa, Asia, the Middle East and South America. In total, 85% is exported. In the 11 years since its foundation, RDM has become a profitable company.

a firing weapon system. The electrically powered, air-transportable MM UGV has all-wheel drive with eight balloon tires, all of which are powered. The MM UGV can be operated for up to eight hours without requiring a battery recharge.

### Mission Modules

Quickly replaceable modules provide equipment for various missions. Each module is connected to the chassis through mechanical and electrical quick connectors. Six module types have already gone beyond the concept phase, of which the variants MISSION MASTER Protection (MM P) and MISSION MASTER Rescue (MM R) were presented in Overberg. The MM P is the armed version of the UGV. It carries a stabilised FIELDRANGER weapon station from Rheinmetall Canada,

equipped with two rocket launchers and seven unguided 70mm rockets from Thales FZ. According to Rheinmetall, MM P is the first air-to-ground system on a UGV. The MM R has two stretchers and medical equipment as well as seats for medical personnel for transport of the wounded (CaseEvac).

### Control

The UGV is controlled and programmed through a portable computer, for example from the ARGUS soldier system and a bi-directional radio link. The system can be remote controlled or operated partially or fully autonomously.

While under fire protection by special units on their HORNET Rapid Reconnaissance Vehicle (RDRV) with heavy and light machine guns and grenade launchers, supported by a towed 20 mm cannon, infantry on foot positioned the MISSION MASTER convoy in 'Follow-Me' mode. The convoy included an armed MM P and MM R to rescue the wounded.

Near the planned firing position, the MM R was held in a covered position. The convoy leader took over the control of the MM P from the cover and led this person remotely through their laptop computer into the firing position. The target data were also entered through computers from the cover and the fire command was given. Each of the seven unguided missiles from two missile launch containers generated a surface fire in the target area in order to suppress the suspected enemy there.

The MM R then took cover near the firing position. The convoy leader now took control of the MM P and steered the vehicle remotely with a portable computer to the firing position. From the cover, target data was entered by computer and then the fire order was given. Each of the seven unguided missiles from two missile launch containers generated a surface fire in the target area to suppress the suspected enemy there. At the end of the firefight, the two MISSION MASTERS were given the command to autonomously dodge into a hide position behind the fire line.

### Start of Production

Denel received the first orders for MISSION MASTER vehicles when development reached technical maturity level TRL7 (Technology Readiness Level). In addition to orders from Italy and Middle East, the German Armed Forces also ordered MM UGV to test the properties and performance of the system against the background of military requirements. ■



# ASDA 2019

**Igor Tabak**

**Adriatic Sea Defense & Aerospace (ASDA) is a specialised tri-service defence exhibition in a large and growing market focused on International Defence, Homeland Security, Cyber Security, Security & Protection and Aerospace.**

The coastal Croatian city of Split hosted the fifth 'Adriatic Sea Defence & Aerospace Exhibition and Conference' (ASDA) from 10 to 12 April 2019. This bi-annual event covers defence, aerospace, cyber defence and homeland security, and is organised by the US company TNT Productions with support from the Croatian Ministry of Defence (MoD). ASDA began in 2011, under a contract for 5 such exhibitions, with the 2019 edition being final one in the initially agreed cycle. As the organisers determined the event series to be a success, during ASDA 2019, a contract was subsequently signed for a further five such events to be staged in Croatia.

Unlike some similar industry gatherings in the region, ASDA is not exclusively focused on promoting the defence industry in Croatia but is truly an international event. Official sources claim that this year's edition of ASDA had, in total, 185 exhibitors from 26 countries, making it the largest organised to date. The exhibition space used for the event was 30% larger than 2017, which made it necessary to use secondary exhibition hall as well as open spaces around the Spaladium arena – traditional ASDA venue in Split. This year, the Croatian MoD organised a technical exhibition in the next-door space of the naval base Lora, a successful test of future possible ASDA expansion, as declared by Roman Mikulić, Assistant Minister of Defence and Croatian Armament Director. During the exhibition, a number of specialised panels took place, making together the conference component of ASDA 2019. Most of them were led by experts

Photos: Igor Tabak/Obris.org



*The ASDA 2019 main exhibit hall*

from the ranks of the larger exhibitors, culminating in a discussion on the future prospects of the Croatian defence industry. It is thought that in future ASDA's, this segment of the programme will be further strengthened.

The main benefit of holding ASDA in Croatia are the opportunities for regional networking and outreach. In this light, it is important to emphasise the arrival of 145 official delegates from some 34 countries. All of them were hosted by the Croatian MoD as well as a total of eight ministers of defence and 7 chiefs of staffs from neighbouring and partner countries. This group of VIP visitors took their time

to acquaint themselves with the services and equipment on offer and held a series of talks with various industry representatives. The special feature of ASDA 2019 was the inclusion of three national pavilions - from Israel, Slovenia and Bosnia and Herzegovina, which made it possible to exhibit a coherent palette of products from smaller producers, side by side with world giants such as Lockheed Martin, Bell, Saab, Elbit or Rafael. Altogether, a total of 5,259 visitors came to the event from a total of 46 countries, where the entrance fee earnings were donated to the Croatian military solidarity fund on the final day of the exhibition.

## Author

**Igor Tabak** is an analyst for defence and security based in Zagreb, Croatia, and member of the Homeland Security Council of the President of the Republic of Croatia.





**Foreign defence ministers, chiefs of staff and delegates at the ASDA 2019 opening ceremony**

The international cast of exhibitors was dominated by the companies interested in the defence requirements of Croatia and the region. So, there were the two main contenders for the new fighter aircraft of Croatian Air Forces - the Swedish SAAB, which brought a large model of JAS 39 Gripen with Croatian markings, and Lockheed Martin, which besides the F-16 simulator, also presented

the Sikorsky UH-60 Black Hawk. These are helicopters that Croatia might consider procuring after the recent arrival of an US donation of two such aircraft. Bell Helicopters has emphasised their civilian and military products, well represented in Croatia, Montenegro and North Macedonia, while MBDA and Rafael presented their respective ranges of various missiles for the defence of air and coastal spaces.



**A JAS 39 GRIPEN model with Croatian markings at SAAB's stand on ASDA 2019**

The Israeli Elbit presented the future composition of its 30mm weapon station on Croatian AMV Patria armoured transport vehicles, which is soon to be delivered to the Croatian Armed Forces. A range of communications equipment was presented, among others, the Rohde & Schwarz digital radios of the Soveron line, which are to equip the German Bundeswehr within the scope of the SVFuA programme. Also significant was the range of unmanned systems on offer from multiple parties, complimented with various defensive solutions for combating the emerging threats that such drones pose to military and civilian sphere alike. As stated by the Croatian MoD, this element of unmanned systems and defence thereof, as well as the cyber defence might form a topic to be highlighted during the next ASDA, scheduled for Spring 2021. While the presentation of the Croatian defence industry did not overwhelm the ASDA 2019 programme, it was nevertheless present and visible. The demonstration by the Croatian Armed Forces presented the joint capabilities of the Croatian Navy, Air Force and newly formed marine units, while also deploying its new Brodosplit patrol ship, OOB-31 'Omiš', a prototype that is being tested before a becoming the first vessel in a class of five similar ships. HS Produkt from Karlovac, the Croatian producer of handguns - represented on the US market by Springfield Inc. (voted US handgun of the year in 2003, 2006, 2009 and 2013) - presented its range of assault rifles, while also showcasing its upcoming co-operation with FN Herstal. The product of this partnership will be HS Produkt taking part in the worldwide production of FN Minimi, while offering the Squad Automatic Weapon for the Croatian Army as well. The scope of personal infantry equipment was rounded through domestic production of apparel, tactical and ballistic equipment presented by the strong exporters Šestan-Busch and Kroko, as well as of new Takrad tactical radios. Ammunition production from a range of producers was introduced through the state-owned Alan Agency, as well as the Croatian capability to manufacture the 8\*8 Patria AMV vehicles by Đuro Đaković consortium from Slavonski Brod. A special emphasis was also placed on the presentation of research and development capacity of the Croatian academia. In particular, space was given to the Faculty of Mechanical Engineering and Naval Architecture from Zagreb, whose student team won the US AIAA Graduate Team Aircraft Design Competition in late 2018. ■

## Fighter Jet Training Aircraft up for Lease

(ck) Buying trainer aircraft outright is a major investment for any air force and much of that investment is wasted when the planes are



Image: AERIALIS

standing idle because training needs have changed. AERIALIS, a recently formed British company developing military and aerobatic jet trainer aircraft and flying training systems, is promising to change all this with a new leasing arrangement for fighter jet pilot training aircraft which promises to reduce costs for customers. Adopting a modular concept built around a common long-life fuselage, the AERIALIS suite of jet trainers is fully customisable in terms of engines, outer wings and avionics, enabling end-users to configure their fleet of training aircraft to match the needs of their trainee pilots. The AERIALIS suite of jet trainers will have 85% commonality of parts allowing for cost savings when purchasing more aircraft. With AERIALIS' leasing arrangements, the customer will not be burdened with huge purchasing costs but will have the ability to flex their flying training system as their requirements change over time. AERIALIS promises that leasing trainer aircraft will offer a significant return on investment (ROI) due to a fuselage that can be easily re-roled and which is built to outlast traditional airframe structures.

## Leadership Changes at Airbus

(ck) Airbus has announced several senior leadership changes. Antoine Bouvier



Photos: Airbus



(59; photo left) became Head of Strategy, Mergers & Acquisitions and Public Affairs on 1 June 2019. In this position, he reports to Guillaume Faury, CEO of Airbus. At MBDA, Bouvier was succeeded as CEO by Eric Béranger (56), who has held a number of leadership positions in Airbus Defence and Space. His appointment also became effective 1 June 2019. MBDA, a joint venture between Airbus (37.5%), BAE SYSTEMS PLC (37.5%) and Leonardo S.p.A. (25%), is Europe's leading missile systems house. Furthermore, Patrick de Castelbajac (47, photo right) has been appointed Head of Region Asia-Pacific for Airbus, effective 1 June 2019. In this capacity he succeeds Jean-Marc Nasr who was recently appointed Executive Vice President Space Systems within Airbus Defence and Space. De Castelbajac has also been named Head of Sales Asia-Pacific for the company's commercial aircraft business as of 1 July 2019: as such De Castelbajac will be responsible for one of Airbus's most strategic growth regions.

## Curtiss-Wright to Support MQ-25 Unmanned Tanker

(ck) Boeing has contracted Curtiss-Wright's Defence Solutions division to supply data technology systems for the aircraft carrier-deployed MQ-25 unmanned tanker aircraft programme. The MQ-25 is the US Navy's first operational carrier-based unmanned aircraft and is designed to provide a much-needed refuelling capability. The MQ-25 programme is intended to increase the range of the carrier air wing. Curtiss-Wright will support Boeing's engineering and manufacturing development programme to provide four MQ-25 aircraft to the US Navy for Initial Operational Capability by 2024. For more than 60 years Curtiss-Wright has been a supplier to Boeing, and this latest MQ-25 contract will require the addition of half a dozen engineers and technicians at Curtiss-Wright.

## First Maintenance for Aircraft Carrier QUEEN ELIZABETH

(ck) Babcock International has completed the first docking and maintenance period on HMS QUEEN ELIZABETH at its Rosyth site. After the six-week work package was delivered, the Royal Navy's QUEEN ELIZABETH (QE) class aircraft carrier departed from Rosyth at high tide, through the specially designed roller-fender system, into the River Forth. As the assembly site for the UK carrier programme, the Rosyth facility has had significant investment over recent years. Babcock has been charged with maintaining the carrier in optimum condition and a

Photo: Babcock



100-strong team carried out work during the docking period, replacing 284 hull valves and renewing all cathodic protection electrodes and anodes, as well as painting the hull and working on the stabilisers, rudders and shaft lines. HMS QUEEN ELIZABETH and her sister ship, HMS PRINCE OF WALES, are the largest warships ever built for the Royal Navy. Due to enter service in 2020, HMS QUEEN ELIZABETH has a four-acre flight deck and two propellers weighing 33 tonnes each. She is capable of carrying up to 40 aircraft, as well as weaponry and communications systems.

## Gravitec Opens Production Facility in Turkey

(ck) Gravitec, a company specialising in energy absorbing seats, will open a new facility in Turkey to supply the domestic armoured vehicle industry with its blast protection seats. Gravitec offers several blast mitigating seats, from ergonomic troop seats to more complex driver and commander seats. With its "Made in Turkey" strategy, Gravitec intends to become a key supplier to the Turkish and Eurasian armoured vehicle industries as well as to export to other countries from Turkey. Gravitec's seats comply with STAN-AG4569 Levels 3 and 4, the NATO standard for protection levels of occupants in armoured vehicles.



Photo: Gravitec

## INVISIO to Supply German Police Force

(ck) Defence and security communications equipment is being modernised throughout the world, and in Germany numerous companies are competing for lucrative orders. INVISIO, with its partner IMTRADEX, has received a major order (up to SEK10M) from a regional German police force. Lars Højgård Hansen, CEO of INVISIO, said, "Winning this tender is a breakthrough for INVISIO in Germany and with police forces." The systems from INVISIO are claimed to guarantee good



hearing protection and enable the user to communicate with constant situational awareness under extreme conditions.

## Karsa Oy Joins EOS

(ck) Karsa Oy, a developer of CBRNE threat detectors for security applications, has joined the European Organisation for Security (EOS), the voice of the European security industry and research community. Founded in 2016 by a team of detection experts from the University of Helsinki, the company is currently developing explosives detection equipment with high sensitivity and specificity to provide increased detection capabilities at lower costs than current technologies. Whilst the technology is primarily aimed at the global air cargo market it can also be applied to customs and border protection and emergency management.



Photo: Karsa

## New Vice President Communications at Lockheed Martin

(ck) Lockheed Martin has appointed Dean Acosta as Senior Vice President, Communications, effective since 20 May 2019. Acosta has almost three decades of experience in corporate communications in the technology, energy and aerospace and defence industries. Most recently, he served as Vice President and Chief Communications Officer for Resideo, a smart home technology company, where he led employee and executive communications, media relations, social media and public affairs. Prior to that, Acosta was Vice President of Global Communications for Honeywell's Home and Building Technologies business. He also served as Director of Communications for Lockheed Martin's Corporate Engineering organisation. Acosta earned his bachelor's degree from the University of Texas at San Antonio, his master's degree in strategic communication from Seton Hall University and he began his career as a broadcast journalist, winning an Emmy award for his reporting.



Photo: Lockheed Martin

## New Key Account Executive at Marshall Aerospace and Defence

(ck) Marshall Aerospace and Defence Group has appointed Lee Doherty as Key



Photo: Marshall Aerospace and Defence

Account Executive where he will be responsible for developing relationships with the company's leading customers. Doherty joins the company after 14 years at Rolls Royce in a range of international business development and supply chain management roles. Prior to this, Doherty spent over 20 years in the Royal Air Force as a Supply and Movements officer in UK-based and international roles: in Hong Kong he co-ordinated the logistics recovery on the handover of the region to China in 1997; similarly he worked in Saudi Arabia during Operation Desert Storm; and he led humanitarian convoy operations in Sarajevo for the UN. His final appointment was in the UK MoD's Defence Logistic Operation in Bath, England. Doherty was commissioned into the Royal Air Force in October 1983 and subsequently gained an MA at King's College.

## Simulation Software for the Bangladesh Army

(ck) In 2015, MASA, a company developing simulation software for defence applications, signed its first contract with the Bangladesh Army Training and Doctrine Command (ARTDOC) to provide them with a customisable training solution. Now ARTDOC has signed a follow-on contract with MASA for the company to provide maintenance of its SWORD software to the Army War Game Center (AWGC) until 2023. MASA's flagship product, SWORD, which can simulate and control tens of thousands of soldiers and units, enables the Army to immerse its training audience in different types of military and civil emergency scenarios. The AWGC chose SWORD for command post training from battalion to division level. Bangladesh has successfully used SWORD for two years for a variety of exercises including military and disaster relief training and MASA has supported the AWGC during this time with maintenance and software upgrades.

## Digital Innovation in Naval Defence

(ck) The global naval defence market received €40Bn in revenue in 2018 and is expected to grow steadily by 4% each year. Nonetheless, there is fierce competition between European, Chinese, Russian and South Korean companies.

In response to this, Naval Group has been expanding its investments to maintain a technological edge and has joined b<>com, a European innovation centre based in France and a pioneer in digital dual-use technologies. Naval Group will benefit from a partnership with the researchers and engineers at the centre and the two partners will work on digital naval defence solutions. By partnering with b<>com, Naval Group plans to maintain a digital advantage in areas that have become essential, such as advanced communication networks, software radio, image and sound processing, artificial intelligence, cyber defence, and cognitive technologies.

Photo: Naval Group



## A Deployable Communication Cube

(ck) When NATO units are deployed they carry their communications technology with them, namely NATO's Deployable Communications and Information System (DCIS). The DCIS consists of a static portion, situated in NATO data centres, and deployable points of presence. The deployable portions are, essentially, transportable mini data centres and can come in boxes of different sizes and weights, not all of which can be carried easily: some can weigh as much as 150 kilograms. NATO recognises the need for one standardised box that is easy to carry and replace. Accordingly, last year, the Agency involved industry-leading architects in testing a new approach for a modern DCIS: the DCIS Cube, a deployable mini data centre. The new approach was a success and, as a result, the Agency is planning to work with an even larger group of companies this year on other aspects of the DCIS. Instead of having boxes of varying sizes and weights that can serve as different parts of a communications system, the DCIS Cube calls for one common box that can be programmed to serve those different purposes. This means that NATO forces

need only carry a single box of spare parts with them for repairs and that the DCIS Cube can be carried by two people, making it a better fit for deployments. Its functionality comes from its software and it can be programmed automatically in a matter of hours. The Agency expects to obtain up to 30 Cubes from a larger infrastructure contract known as the Firefly project. The contract award is planned for 2019.

### Maintenance of Special Aircraft

(ck) The Royal Australian Air Force (RAAF) has contracted Northrop Grumman to continue providing through-life support to the Commonwealth's special purpose aircraft (SPA) VIP fleet operated by No. 34 Squadron in Canberra. This sole source, 18-year rolling wave contract has an initial period of six years for sustainment and maintenance valued at AUS\$84M. Northrop Grumman will service the SPA fleet by providing logistics, maintenance, engineering and training. The work will be supported by a programme manage-



Photo: Northrop Grumman

ment office in Melbourne. The SPA fleet comprises two Boeing Business Jet (BBJ) aircraft and three CHALLENGER CL604 jets which are being replaced by three FALCON 7X business jets. The RAAF's SPA capabilities are set to ramp up mid-year with the delivery of a KC-30A Multi Role Tanker Transport modified to support long-range government VIP transport needs.

### Results from Survey into Lighting Tools

(ck) PELI Products, the US manufacturer of lighting tools, has conducted a survey of European users from different in-

dustries – industrial safety, security, law enforcement, military, general industrial, outdoor, fire and rescue, and so forth – on the expectations of those users in terms of lighting tools. The survey showed that 66% of respondents preferred a hand-held torch to a headlamp. More than 50% of the respondents agreed on a minimum of +500 lumens, a beam distance covering up to 100m, and 10 hours



Photo: Peli

of usable run time. In response to questions about size and weight, 49% of the survey participants preferred a torch of between 11 cm and 20 cm, with a maxi-

## FEINDEF 2019 – Una Feria Impresionante



Organised by the two industrial associations TEDAE (Asociación Española de Empresas Tecnológicas de Defensa, Seguridad, Aeronáutica y Espacio) and AESMIDE (Asociación de Empresas Contratistas Con las Administraciones Públicas de España) and strongly supported by the Spanish Ministry of defence the first-ever FEINDEF exhibition took place at Madrid's IFEMA Exhibition Centre from 29 to 31 May 2019. Some 140 industrial exhibitors took advantage of the event, and in addition the show grounds featured dedicated exhibits of the three services of the Spanish armed forces, as well as of the Ministry of Defence and the Ministry of the Interior. From every point of view the event was very well organised and accompanied by an impressive schedule of dedicated presentations and briefings.

There was remarkable traffic on the exhibition floor, and according to the organisers FEINDEF 2019 could attract the interest of some 10,000 visitors.



Photo: GDELS SBS

**The expected contract award for some 350 PIRANHA 8x8 vehicles - designated DRAGÓN by the Army - was among the dominating subjects at FEINDEF 2019.**

### Objetivos

Although mainly focussed on the Spanish defence market with foreign companies mainly represented by their Spanish subsidiaries – exceptions included Iveco, Leonardo, Lockheed Martin and Rafael – the presidents

of the TEDAE, Jaime de Rábao, and AESMIDE, Gerardo Sánchez Revenga, explained during a press briefing, that FEINDEF's major objectives included:

- Strengthening the role of Spain in the European security and defence environment with Spain to play a key role in future European defence, and
- Providing a bridge to and for the Latin American defence community.

Against this background both protagonists pointed out that already this year the exhibition had attracted the interest of 48 international delegations from 32 countries in Europe, Africa, the Middle East and Latin America, thereof 15 Latin American chiefs of armed forces.

With 77 member companies TEDAE is mainly dedicated to the representation of industries with capabilities at system level, whereas AESMIDE (65 members) regards itself as a supporter of mainly the SMEs in Spain's defence industrial base.

### FUERZA 35

The Spanish Army took advantage of FEINDEF 2019 to draw attention to their FUERZA 35 concept, which describes the land forces material requirements until the year 2035 and covers a widespread spectrum of equipment already in service (like the LEOPARD 2 E fleet), equipment under development/subject to procurement (like the DRAGÓN/PIRANHA 5 8x8 vehicle) and materiel requirements yet to be determined in detail. The latter includes for example an active protection system for the Army's combat vehicles. Remarkably enough, not all of the new programmes will be made subject to a competitive tendering process. Instead, the Army prefers to accompany and influence certain selected industrial development programmes intended to result in equipment items tailor-made in response to the requirements of the service.

### El Futuro

The next FEINDEF, for which the organisers expect a significantly higher number of international exhibitors, will be held in 2021 during the Spanish Armed Forces Week, the date of which has yet to be determined.



mum weight (with batteries) of 200 g. In terms of water level ingress, 37% of the fire and safety users required IP67. The survey respondents all had differing opinions on accessories depending on their working equipment. Indeed, 61% of participants working in industrial safety and fire and rescue preferred a light that could easily be used with gloves.

## New Market Area Leader at NIXU

(ck) European cybersecurity services company, Nixu, has appointed Matthijs van der



Photo: NIXU

Wel as Market Area Leader Benelux to lead the operations and further growth of Nixu in the region. Nixu started operations in the Benelux market by establishing a subsidiary in the Netherlands in

2016. Since entering the market, Nixu has focused on recruitment and building its market presence in the Benelux cybersecurity market. Van der Wel's task will be to grow Nixu's market position in cybersecurity services for local enterprises. Van der Wel has nearly 20 years of experience in the cybersecurity industry and a track record in building and developing cybersecurity organisations. Prior to joining Nixu, he served at Fox-IT, at Booking.com as a Corporate Security Officer, and as Director Cyber Forensics at PwC in The Netherlands.

## New International Partner Manager at OTM

(ck) OTM Servo Mechanism, a designer and prototype developer for actuation



Photo: OTM

solutions, has appointed Jeremy Abel as International Partner Manager. In this newly created role, Abel will be helping OTM's international business partners to identify and secure new

business opportunities for their design team. Abel comes to OTM following an international business career which has included several projects in Africa. At OTM, Abel's initial focus will be on South America and India.

## Rohde & Schwarz to Partner with Hamburg's Bundeswehr University

(ck) A Rohde & Schwarz (R&S) subsidiary, ipoque GmbH, has formed a strategic research partnership with Helmut Schmidt University in Hamburg in order to establish a programme of exchange and collabora-

Photo: ipoque



tion. ipoque GmbH provides network analytics solutions for secure, reliable and efficient networks and the partners' research, focussing on artificial intelligence, machine learning and big data analytics, will run for 4 years. Maintaining the security and reliability of networks is crucial as the challenges presented by IP traffic rates, protocol complexity and the number of cyber attacks continue to increase. A main focus of the partnership will be the potential of future technologies to enhance network analytics and security solutions.

## Lockheed Martin to Team with Rafael

(ck) As access to GPS is becoming increasingly limited in contested environments, Rafael's Smart, Precise Impact and Cost-Effective (SPICE) guidance kits provide a solution to this challenge. SPICE is a family of stand-off air-to-surface weapon systems

Photo: Lockheed Martin



for GPS-denied environments. In use since 2003, SPICE is currently in service with the Israeli Air Force and several other nations. Lockheed Martin and Rafael Advanced Defense of Israel have now signed a teaming agreement to develop, market, manufacture and support SPICE for US sale. The agreement covers the SPICE 1000 (1,000 pound/453 kilogramme weight class) and SPICE 2000 (2,000 pound/907 kilogramme weight class) kit variants. John Varley, Vice

President of Close Combat Systems at Lockheed Martin Missiles and Fire Control, says, "We will adapt SPICE to meet US standards so bomber and fighter aircraft can benefit from the added mission flexibility that SPICE offers."

## New Raytheon Office in Warsaw

(ck) Poland is the 16th nation to use PATRIOT to defend itself against ballistic and cruise missiles. Raytheon has now opened a new headquarters in Warsaw and this will be the setting for other defence initiatives and the place where future cyber security and missile defence programmes will be developed. The new headquarters houses the WISLA air and missile defence programme as well as a centre for strengthening Polish security and developing the country's defence industry. The need for the WISLA Programme Office became clear when the Polish government signed an agreement with the US government on the purchase of the PATRIOT missile defence system. The centre will establish the Polish defence industry as a solid player on the world market and will assist in boosting the number of jobs in the defence industry in both Poland and the USA. As part of the WISLA programme, Poland intends to acquire additional PATRIOT fire units, gallium nitride active electronic raster radar and SKYCEPTOR, a low-cost interceptor rocket.

## RENK Purchases Suspension Specialist

(ck) As part of its internationalisation strategy, RENK AG has completed the acquisition of Horstman Holdings Ltd and its group of companies. Horstman is a player in the global armour and tracked vehicle mobility markets and known for its hydraulic and hydropneumatic suspension systems. The acquisition will expand the product portfolio of RENK's vehicle transmissions unit, further develop RENK's expertise in powertrains for tracked vehicles and strengthen its global presence. Horstman operates three areas of business: Mobility, Project Build Services and Environmental & Power and currently employs 157 staff across its locations in the UK, the USA and Canada.

## Modernisation of Dutch Armoured Recovery Vehicles

(gwh) The Dutch army has contracted Rheinmetall to modernise its fleet of armoured recovery vehicles (ARVs). In the first phase of the project, four armoured recovery vehicles will be upgraded, and a further 21 vehicles will be upgraded in the second phase. Each phase has a contract value of a double-digit million euro sum. The modernisation of the

BERGEPANZER 3 BÜFFEL (BUFFALO) ARVs is intended to extend the service life of the vehicles until 2040 and the first modernised recovery tanks are to be delivered to the troops at the beginning of 2021.



Photo: Rheinmetall

In addition to a complete overhaul of the individual ARVs, the modernisation work includes: conversion to a new digital operating concept, the installation of modern visualisation equipment, mission packages with ballistic and mine protection as well as new battlefield recovery equipment and a universal support platform.

The new battlefield recovery system has been relocated to the rear of the vehicle which will enable the crew to hook up to a damaged vehicle and tow it from the battlefield at high speed, in a forward gear, without having to leave the safety of the fighting compartment. The new universal transport platform on the rear of the vehicle can be used flexibly and can, for example, carry additional equipment for the recovery of other vehicles.

Similar mission configurations are being used by NATO partner Canada and the Swedish armed forces, whilst, in December 2018, the Bundeswehr commissioned the modernisation of its ARV fleet in order to ensure its suitability for current operational scenarios.

### RUAG Completes NH90 Inspection

(ck) RUAG MRO International has completed the first inspection of an NH90 helicopter for the German Bundeswehr having given the Bundeswehr an alternative support provider for NH90 maintenance. Volker Wallrodt, Senior Vice President at RUAG MRO International, said, "The Bundeswehr is our long-standing customer and RUAG is well positioned to meet their requirements in full." Before RUAG could begin working on the NH90, in autumn 2018, a type rating was required from the German Military Aviation Authority. This involved meeting requirements such as: rules on personnel certifications, process instructions, technical

documentation, infrastructure, as well as providing fully equipped aircraft docking facilities. Information technology services also needed to meet requirements as all maintenance tasks had to be documented in the Bundeswehr's IT system which therefore required the Oberpfaffenhofen site to implement the required SASPF software. RUAG has been a partner to the German Bundeswehr over many years and provides maintenance services for the Bell UH-1D helicopter fleet, still in use for search and rescue missions.

### Maintenance for ANSAT Helicopters in Mexico

(ck) In cooperation with Russian Helicopters (part of Rostec State Corporation), the Mexican company Craft Avia Center plans to open a technical maintenance centre for ANSAT civil helicopters in Guadalajara. The centre will be equipped with the appropriate technology, have the required documentation and is currently planning the training of Mexican technical service technicians. The first ANSAT helicopter will be delivered to the Craft Avia Center in 2019. Rostec is focusing on strengthening cooperation with Mexico as well as building long-term relationships across Latin America. In 2014-2015, Russian Helicopters successfully overhauled 19 helicopters operated by the Mexican MoD and, currently, the company provides after-sales support for the entire fleet of Mi-17 helicopters operating in Mexico. The ANSAT light



Photo: Russian Helicopters

multi-purpose helicopter has the largest cabin in its class. The twin-engined helicopter is compact in size and does not need a large landing area. It can be used for normal passenger and VIP traffic, cargo delivery and environmental monitoring. ANSAT is capable of operating in mountainous areas at altitudes of up to 3,500 metres. The Mi-17-1V multi-purpose helicopter is one of the Mi-17 modifications developed by Mil Moscow Helicopter Plant, a subsidiary of Russian Helicopters. The helicopters have gained recognition for their performance, ease

of operation and reliability. Mi-17-1V has a top speed of 250 km/h and a maximum range of over 600 kilometres. It can accommodate up to 37 paratroopers. The civilian variant is often used for goods and passenger traffic, firefighting and rescue operations.

### Saab International Press Tour 2019

(ure) Starting with high level briefings by the President and CEO of Saab AB, Håkan Buskhe, and the Swedish Minister of Defence, Carl Anders Peter Hultquist, this year's edition of Saab's International Press Tour (20 – 24 May) concentrated mainly on products and projects relating to military aviation. The main presenta-



Photo: Saab

tions comprised an update on the status of GRIPEN E and GLOBALEYE as well as an insight into Saab's share of the TX-Programme which will produce the next generation of advanced training aircraft for the USAF and possible other worldwide customers. Additionally, Saab presented their proposal for operating and managing airfields under drone threat. This includes hardware and software to operate (multiple) airfields remotely from control centres (already in operation for some Swedish airfields and looked at by the military) and the Enhanced Low Slow and Small (ELSS) software that allows (newer generation) radars of the GIRAFFE family to detect very small objects and to classify them automatically. The tour ended with a visit to Lulea Air Base where the Swedish Air Force ran the Arctic Challenge Exercise (ACE) 2019. ACE is a bi-annual, multinational exercise capitalising on the large test and exercise airspace in northern Sweden and projected to reach the quality of flag level exercises in the near future.

### WEW Becomes Thielmann

(ck) THIELMANN WEW will be rebranded as the defence business line of THIELMANN. The defence business line will continue to operate out of Weitefeld, Germany, where it has been based for



more than two decades and, as part of the THIELMANN company, the Weitefeld defence team will continue to serve its customers with deployable fuel and water solutions for forward deployed operations and expeditionary logistics. Over a three-year transition period, THIELMANN has focused on incorporating WEW's defence capabilities into its wider container solutions portfolio, while bolstering the unit's financial position. The Weitefeld facility has also undergone modernisation; it can supply containers with a storage capacity of between five and 80,000 litres. THIELMANN IBCs and tank containers have approvals in place for transporting more than 1,800 hazardous liquids, toxic gases and dry-powder bulk. Within the defence market, THIELMANN supplies modular water and fuel solutions for defence forces worldwide, including the German, US, British, Austrian, Lithuanian, Slovenian, Irish and Belgian armed forces, under its THIELMANN WEW brand.

### President of WB Group Receives Award

(ck) In recognition of his services to the development of the Polish economy, the President of the WB Group, Piotr Wojciechowski, was honoured by Prime Minister Mateusz Morawiecki in the Prime

Photo: WB Group



Minister's Chancellery with the "Medal for the 100th Anniversary of Regaining Independence". The medal was awarded on behalf of Prime Minister Morawiecki by Jadwiga Emilewicz, Minister of Entrepreneurship and Technology.

### New CEO at UVision

(ck) UVision Air Ltd, a designer of lethal loitering systems, has appointed Avi Mizrachi as its new CEO. Mizrachi joins UVision after 35 years of service in the Israel Defense Forces (IDF), during which he held a number of senior positions including: the Head of the Logistics Directorate, the Chief of the Ground Forces, and the Head of the IDF Central Command. After his retirement from the IDF, Mizrachi served as EVP of International Marketing at Elbit Systems.

Photo: UVision



## Preview

- Defence and Security in Poland
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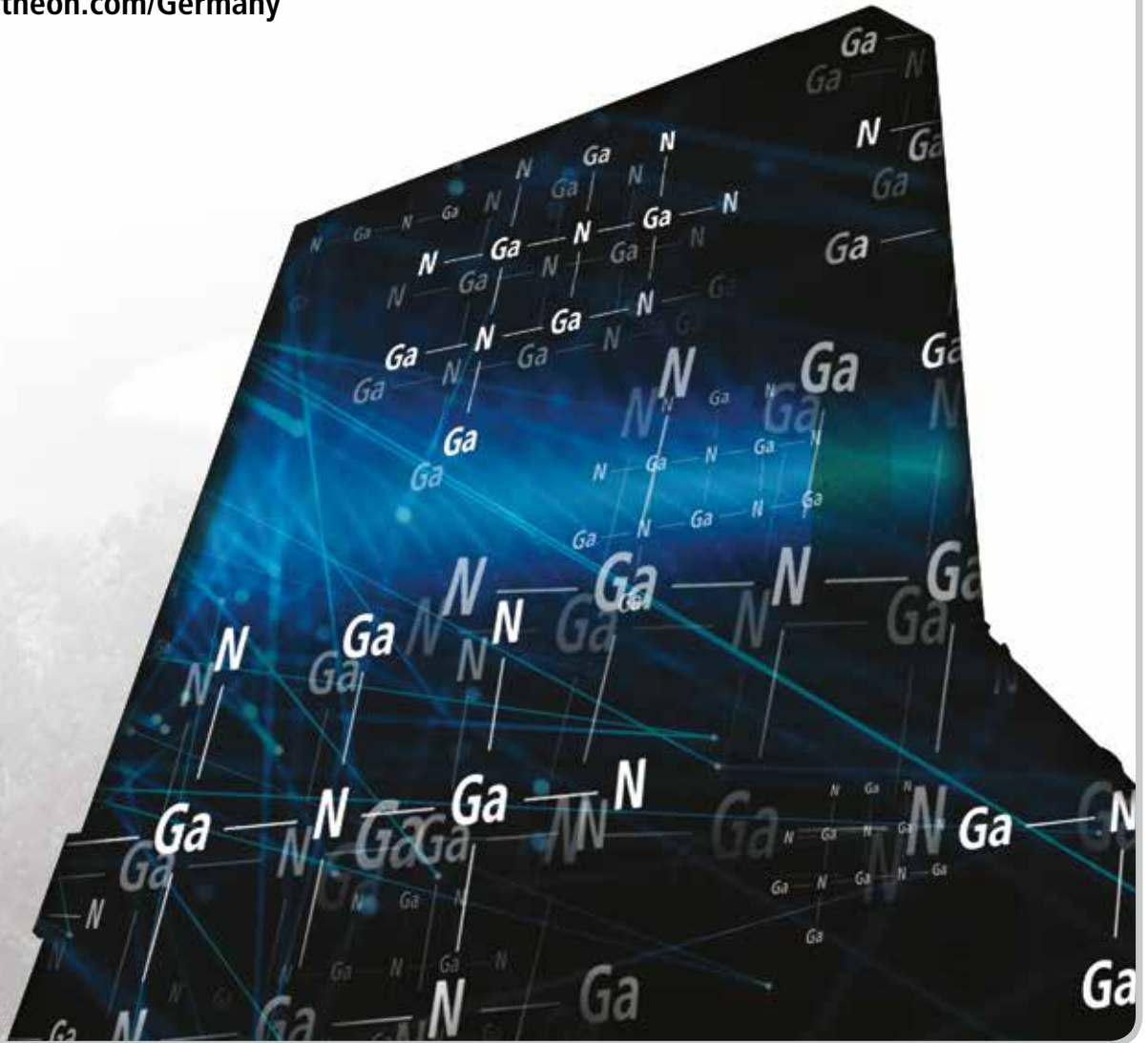


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