

# European Security & Defence

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*International Security and Defence Journal*



**COUNTRY FOCUS:**  
GERMANY



## Autonomous Warriors

- Franco-Egyptian Defence Partnership
- AWACS Replacement
- Egyptian Navy
- First Aid Training and Simulation
- International Corvette and Frigate Programmes



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## Good Luck to Us



At the time this issue goes to print, the ballots in several US states are still being counted. But it is very likely that Joe Biden has won the presidential election in the United States, making this election one of the most important events of international relevance of this year. Others certainly include the death of George Floyd spawning heavy turmoil and nighttime curfews in over 40 cities in the US and giving impetus to the global Black Lives Matter movement. Or the protests in Belarus as a result of the presidential elections, the United States' withdrawal from the World Health Organisation, the terrorist assaults in Vienna and Nice and, above all, the global COVID-19 pandemic.

But as this is already the last issue of the year, I would also like to review a number of incidents and occurrences that have not been subject to extensive press coverage, but turned out to be of noticeable relevance to the team of European Security & Defence and all other employees and the management of our publishing house.

On 26 February 2020 the Managing Director of Mittler Report Verlag and Editor-in-Chief of this magazine, Dr Peter Bossdorf, died as a result of an aortic aneurism. His death hit us all completely unexpected, as most of us had still been in personal contact with him in his office the day before— with no signal at all about what was going to happen. Nobody had ever considered anything like this could happen, and it was like having to turn around while racing downhill. Peter's responsibilities and duties had to be delegated and re-distributed from one day to the next, as a result of which the undersigned was assigned the position of the Publishing Director of the group's Bonn-based operations and responsibility as the Editor-in-Chief of this magazine whereas Stephen Barnard was promoted to the magazine's Publisher, thus assuming commercial responsibility for ESD. To all of us, the future looked very foggy and our owner Peter Tamm expected a significant downturn in the company's overall revenue.

Like everybody else, COVID-19 hit us the month after and the lockdown in Germany came in April. With that, practically all events and exhibitions were cancelled and with ESD as a magazine frequently used by industry to draw attention to their exhibition presence by means of "Meet us at..." advertisements we expected a further downturn in business, independently from the scheduled weekly interruption of our daily business processes because we physically moved to a new office facility at Beethovenallee 21 in the Bad Godesberg "Villenviertel" in June.

In August, Waldemar Geiger, with the support of André Forkert and Dr Jan Phillipp Weiswange launched [www.soldat-und-technik.de](http://www.soldat-und-technik.de) as a new German language website dedicated to matters of interest to the individual infantryman. In the meantime, the website – complementing [mittler-report.de](http://mittler-report.de), [esut.de](http://esut.de) and [euro-sd.com](http://euro-sd.com) – proved to be successful, both in terms of visitor numbers and commercially.

At the beginning of September, as a result of company owner Peter Tamm's most recent acquisition of K&K Medienverlag Hardthöhe, our new colleagues from the magazine Hardthöhenkurier joined us at our new office facilities, bringing along the necessity of harmonising previously different business approaches and cultures.

In October, we published the pilot issues of our new international naval magazine Maritime Security & Defence, which will see five regular issue next year and is scheduled to appear as a bi-monthly from 2022.

In November, Lars Hoffmann joined the company as our new Editorial Director, also extending the online offerings of Mittler Report by his own website and online portal [www.hartpunkt.de](http://www.hartpunkt.de). Now, have all these developments lead to the expected downturn of our business? Well, they haven't.

As a matter of fact and despite deep mourning for Peter Bossdorf, in terms of turnover, revenue and reputation, 2020 has been the best year ever since the company has existed in its current format.

Although this achievement could certainly only be accomplished with some bits of unexpected luck, it is the result of the efforts invested not only by the employees of Mittler Report Verlag, but also by our numerous authors, subcontractors, partners and clients. And the continued confidence in our work by you, our readers.

Thank you all for this, and let's wish ourselves all luck for the year ahead. It won't be an easy one. Merry Christmas to those who live in a Christian environment and season's greetings and a Happy New Year to everybody!

**Jürgen Hensel**

Photo: Pieter Bastiaans



The 2020 edition of the annual airmobile exercise **Baccarat** saw the French army air corps' 4e Brigade d'Aerocombat (4 BAC) preparing for major combat. **Page 52**

Photo: AMI



Bob Nugent looks at corvette and frigate programmes currently ongoing around the world. **Page 90**

## ■ SECURITY POLICY

- 12 **The Enduring Franco-Egyptian Defence Partnership**  
David Saw
- 20 **Indonesia Searching For a Defence Direction**  
David Saw

## ■ COUNTRY FOCUS: GERMANY

- 24 **Germany as a Strong Player in Security Policy Environment**  
Rolf Clement
- 28 **Continue and Consolidate Trend Reversals**  
Interview with General Eberhard Zorn, Inspector General of the Bundeswehr
- 32 **Our Priority: Improving the Materiel Readiness of Weapon Systems in Current and Future Service**  
Interview with Vice Admiral Carsten Stawitzki, Head of the Equipment Department at the German MoD
- 38 **Opportunities and Challenges for the German Security and Defence Industry in 2020**  
Dr. Hans Christoph Atzpodien / Adrian Schwantes
- 42 **Bundeswehr Cyber Innovation Hub**  
Sven Weizenegger and Dr. Stephanie Khadjavi

## ■ ARMED FORCES

- 46 **Egypt: A Regional Naval Power?**  
Conrad Waters
- 52 **Exercise Baccarat 2020 – Aerocombat Hits the Alps**  
Pieter Bastiaans

## ■ ARMAMENT & TECHNOLOGY

- 56 **Security Landing – Germany's Heavy Transport Helicopter Project in Limbo**  
Ulrich Renn
- 59 **Lethal Aim – Virtual vs. Life Firing Training**  
Trevor Nash

- 62 **Sims versus Reality: Training JTACs**  
Alan Warnes
- 64 **Merging Cyber into a Multi-Domain Common Operational Picture**  
John Antal
- 68 **Continued Controversy Surrounding French RAFALE Fighters**  
Suman Sharma
- 70 **Record Levels of Indian Missile Testing Amidst Ongoing Border Standoff**  
Suman Sharma
- 71 **Austria to Partner Italy on Joint Helicopter Project**  
Georg Mader
- 74 **France Prepares for New Truck Competition**  
David Saw
- 78 **Autonomous Warriors**  
Tamir Eshel
- 84 **The Evolving UAS Spectrum**  
David Saw
- 86 **First Aid Training and Simulation**  
Alex Horobets
- 90 **International Corvette and Frigate Programme Outlook**  
Bob Nugent
- 96 **Eyes in the Sky for Boots on the Ground**  
How to Renew the NATO AWACS fleet  
Bo Leimand

## ■ INDUSTRY & MARKETS

- 99 **20 Years of L-159**  
Alan Warnes
- 100 **"We have more foreign aircraft to upgrade in here, than we've had in years!"**  
Interview with Dieter John, CEO, AERO Vodochody
- 101 **Ukrainian Defence Exports**  
Alex Horobets

- 106 **Keeping the “Birds” Flying**  
Interview with Shaul Mazor, Vice President for Marketing and Business Development at Bird Aerosystems
- 108 **EURONAVAL 2020**  
Naviris and Navantia update on the status of the EPC programme
- 112 **Small Arms Ammunition – Trends and Suppliers**  
David Saw

■ **VIEWPOINT FROM ...**

- 11 **Vienna**  
Georg Mader
- 55 **Kiev**  
Denys Kolesnyk
- 67 **New Delhi**  
Suman Sharma
- 76 **Tel Aviv**  
Tamir Eshel
- 77 **Bonn**  
Rolf Clement
- 111 **Paris**  
David Saw

■ **COLUMNS**

- 1 **Editorial**
- 4 **ESD Spotlight**
- 109 **Masthead**

**Index of Advertisers**

|                             |                       |
|-----------------------------|-----------------------|
| AM General                  | 4 <sup>th</sup> cover |
| Autoflug                    | 57                    |
| Bren-Tronics                | 41                    |
| Daimler                     | 25                    |
| Diehl Aviation              | 17-19, 37             |
| Elettronica                 | 27, 39                |
| FNSS                        | 3 <sup>rd</sup> cover |
| Future Forces Forum         | 81                    |
| Hagenuk                     | 29                    |
| IDEX                        | 83                    |
| Innosystec                  | 34                    |
| InVeris                     | 7, 63                 |
| Koehler                     | 45, 110, 113          |
| Leonardo DRS                | 23                    |
| Naval Group                 | 47                    |
| Nexter                      | 13                    |
| NIMR                        | 15                    |
| NITRO-CHEM                  | 51                    |
| Northrop Grumman LITEF      | loose insert          |
| ODU                         | 35                    |
| Oshkosh                     | 9                     |
| Pearson                     | 36                    |
| Raytheon ELCAN              | 2 <sup>nd</sup> cover |
| Raytheon Missiles & Defense | 33                    |
| Roda                        | 31                    |
| Saab                        | 91                    |
| Secunet                     | 65                    |
| Sensoror                    | 3                     |
| TCI                         | 5                     |
| WB Group                    | 16, 89                |



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■ **Boeing HARPOON Missiles for Taiwan**

(JC Menon) Shortly after getting approval to purchase High Mobility Artillery Rocket Systems (HIMARS) M142 Launchers and 135 AGM-84H Standoff Land Attack Missile Expanded Response (SLAM-ER) missiles, Taiwan will receive 100 HARPOON Coastal Defence Systems (HCDS) and related equipment for an estimated cost of US\$2.37bn. The US Government has given the go ahead to sell the HCDS, consisting of up to 400 RGM-84L-4 HARPOON Block II Surface Launched Missiles and four RTM-84L-4 Harpoon Block II Exercise Missiles. The deal also includes:

- 411 containers
- 100 HCDS Launcher Transporter Units
- 25 radar trucks
- Spare and repair parts
- Support and test equipment

■ **Backlash Against Taiwan**

All these defence deals come at a time when Taipei faces rising tensions with China, which claims democratically-run Taiwan as its own territory, to be taken by force if needed, a threat the island has lived with since 1949. Meanwhile, China's Foreign Ministry said the country will take the necessary measures to uphold its sovereignty and security interests

Photo: ESD archives



after the US approved the potential arms sales. China urged the US to stop the arms sales to prevent further damage to China-US relations, foreign ministry spokesman Wang Wenbin said at a regular news conference in Beijing. China also announced it would sanction Lockheed Martin, Boeing Defense, Raytheon and other US companies involved in Washington's arms sales to Taiwan. This proposed sale will improve Taipei's capability to meet current and future threats by providing a flexible solution to augment existing surface and air defences.

"With this Taipei will be able to employ a highly reliable and effective system to counter or deter maritime aggressions, coastal blockades, and amphibious assaults. This capability will easily integrate into existing force infrastructure," a State Department spokesman said. The principal contractor will be the Boeing Company.

Taiwan's President Tsai Ing-wen has recently promised to strengthen the country's defences and work more closely with regional partners on security as she called for 'meaningful dialogue' with China. In a speech to mark Taiwan's National Day, Tsai had said the government would continue to modernise the island's defence capabilities and enhance its capacity for asymmetric warfare to "deal with military expansion and provocation from the other side of the Taiwan Strait". Asymmetric warfare is designed to make any Chinese attack difficult and costly, for example by using smart mines and portable missiles. Analysts feel that if Taiwan gets this defence equipment, it could help thwart a possible invasion by China.

■ **Effective Boeing Solution**

According to Boeing, the HARPOON is capable of executing both land-strike and anti-ship missions, using GPS-aided inertial navigation to hit a designated target. The 500-pound blast warhead delivers lethal firepower against a wide variety of land-based targets, including coastal defence sites, surface-to-air missile sites, exposed aircraft, port/industrial facilities and ships in port. For conventional anti-ship missions, such as open ocean or near-land, GPS/INS improves midcourse guidance to the target area. The accurate navigation solution allows users to discriminate target ships from islands or other nearby land masses or vessels.

■ **Cooperation Between Russia and China**

(yl) "Russia does not need a military alliance with China, but it is theoretically possible to imagine such a thing", Russian President Vladimir Putin said on 22 October, at the meeting of the Valdai Discussion Club. "It is possible to imagine everything. We have always assumed that our relations have reached such a degree of interaction and trust. We, in general, do not need this, but theoretically we can quite imagine this," concluded Mr. Putin.

The Russian leader confirmed that the neighbouring nations conduct joint military exercises on a regular basis, at sea, and on land, within both nations borders. He noted that Moscow and Beijing are actively cooperating in the military-technical area, having projects "on very sensitive topics" which the Russian President did not want to disclose publicly.

Mr Putin confirmed that existing cooperation, "undoubtedly increases the defence capability of the Chinese People's Army". He mentioned that closer cooperation in the military sphere cannot be ruled out. "Life

will show how it will develop further. We are not going to rule it out. We will see", concluded the Russian President.

■ **Cooperation and Trade**

China is one of Russia's key partners in the arms trade. In January 2019, the head of the Federal Service for Military-Technical Cooperation of Russia, Dmitry Shugaev, said that the portfolio of orders for military-technical cooperation with China is more than \$7Bn. According to the head of Rostec Corporation Sergei Chemezov, China accounts for more than 15% of the Russian export portfolio in the field, with the Rostec annual report having just disclosed several details of this cooperation. According to the document, through 2019, the Russian Helicopters Holding signed several contracts with China for the supply of 120+ examples of various rotorcraft. The number includes 68 Mi-171 helicopters (including the upgraded Mi-171E), 18 Mi-171Sh (military transport) helicopters, 14 Mi-171 helicopters with a VK-2500 engine and 21 ANSAT helicopters.

The paper confirms the international debut of the Mi-171Sh STORM (the export version of Mi-8AMTSh TERMINATOR military transport helicopter), a machine which is intended to carry up to 37 paratroopers. It can transport cargo inside the compartment and on its external sling. Simultaneously, the helicopter can provide fire support to tactical airborne assault forces, reconnaissance and sabotage groups, while destroying ground targets. The machine can be also used for the evacuation of wounded personnel.

The helicopter can be equipped with various types of weapons on pylons on the sides of the fuselage, including guided missiles and non-guided rockets. The aircraft is also equipped with means of anti-missile protection and has substantial armour for the cockpit and vital equipment. As reported, Russia was fulfilling a major contract for the supply of S-400 TRIUMPH long range air defence systems and has already delivered 24 Su-35 fighters to the PRC.

■ **20,000 PROTECTOR RWS Systems Delivered**

(gwh) Kongsberg has delivered the 20,000<sup>th</sup> Remote-controlled Weapon Station (RWS) from the PROTECTOR family, after 21 years in production. These systems

Photo: Kongsberg



can be equipped with weapons ranging from 5.56 mm rifles to 30 mm cannons, anti-tank and anti-aircraft missiles, mission-oriented sensor packages and flexible control solutions. The weapon stations have been sold to 23 nations, including Norway, the United States, the United Kingdom, France, Germany, Canada, Australia, the Netherlands and Switzerland. 17,000 stations have been sold to the US alone and are installed as Common Remotely Operated Weapon Station (CROWS) on all sorts of vehicles. RWS systems have replaced many open ring guns and "bird's nests" (protected open weapon control stations) over the last two decades. RWS systems offer high firepower on a stabilised platform with the operator under protection. In addition to armament, the RWS also provides an additional stabilised day/night observation instrument. Combat vehicles such as Infantry Fighting Vehicles and Main Battle Tanks receive an additional weapon for fighting infantry and lightly armoured vehicles as well as against aircraft, especially helicopters. Large classes of 4x4 and 6x6 multipurpose vehicles, in addition to logistics trucks, have also received a significant increase in self-protection thanks to RWS systems.

### ■ Rohde & Schwarz to Supply BONIFAZ Class Frigate Systems

(jr) Spain's new BONIFAZ class multi-mission frigates are to be equipped with external communications systems for line of sight and beyond line of sight communications following a contract with Rohde & Schwarz. These systems will consist of R&S M3SR soft-



Picture: Rohde & Schwarz

ware defined radios (R&S Series4100 HF and R&S Series4400 VHF/UHF) including engineering services and Integrated Logistics Support (ILS).

"Rohde & Schwarz and Navantia have a long history of collaboration and providing the Spanish Navy with the best communications systems," states Hansjörg Herrbold, Vice President Market Segment Navy Rohde & Schwarz. "We are very proud to have our equipment deployed in this major Spanish naval asset and we are looking forward to strengthening our relationship. We make sure that we deliver a safe, future-ready investment for today's navies on time and on budget."

The Spanish Ministry of Defence has ordered five new BONIFAZ class (F-110) frigates to replace the Spanish Navy's SANTA MARIA class frigates. These new vessels will be specialise in anti-submarine warfare in addition to being used for force and fleet protection, maritime security, joint and combined missions alongside preventing conventional and asymmetric threats.

### ■ MICA NG Launched at EURONAVAL

(jr) MBDA has used the virtual Euronaval 2020 expo to announce the commercial launch of its new VL MICA NG air defence system. This is based on the integration into the existing VL MICA system of the MICA New Generation (NG) anti-aircraft missile, which began development in 2018 primarily to equip France's RAFALE combat aircraft. The VL MICA system family has now been adopted, in its naval or land-based versions, by 15 armed forces around the world. Thanks to the technological innovations it incorporates, the new VL MICA NG system offers improved capabilities to handle atypi-

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cal targets (UAVs, small aircraft) as well as future threats, characterised by increasingly low observable infrared and radio frequency signatures. Additionally, it will be able to intercept at longer distances the ‘conven-



Graphic: MBDA

tional’ targets (aircraft, helicopters, cruise missiles and anti-ship missiles) already addressed by the current VL MICA system. The dimensions of the MICA NG munition remain unchanged, allowing it to be integrated into existing VL MICA launchers. The existing missile data link mechanisms are compatible with the increased kinematic performance of the missiles, enabling current VL MICA systems to be upgraded to VL MICA NG standard by simple software updates.

**About the MICA NG missile**

Based on an entirely new design, the MICA NG missile inherits the external dimensions and unique concept that has made the MICA anti-air missile such a success for a quarter of a century. This concept means MICA features either an infrared or a radio frequency seeker on the same common missile body, allowing the operator, at the moment of firing, to select the best option to respond to the tactics adopted by the adversary.

On the MICA NG, a new infrared seeker based on a matrix sensor will provide increased sensitivity, while a new radio frequency seeker with an Active Electronically Scanned Antenna (AESA) will allow for smart detection strategies. The lower volume of electronic components will enable the MICA NG to carry a larger load of propellant, significantly extending its range, and the new dual-pulse rocket motor will provide additional energy to the missile at the end of its flight, improving its manoeuvrability and its ability to intercept targets at long range. In surface-to-air mode, the MICA NG will be able to intercept targets over 40 km away. Finally, maintenance and ownership costs will be significantly reduced thanks to internal sensors that will monitor the status of the munition throughout its life cycle.

The MICA NG missile will be available in series production from 2026.

**Italian PzH 2000 SP Howitzer Modified**

(gh) The NATO Support and Procurement Agency (NSPA) led modification programme for the 68 PzH2000 self-propelled howitzers of the Italian Army has been completed. Cooling systems for the generator and cargo compartment extend the operational spectrum for scenarios characterised by high temperatures while a fire extinguishing system in the crew compartment increases



Photo: NSPA

crew safety. Additionally, a set of tools in a “Live Firing Box” enables cleaning and maintenance of the firing mechanisms “in action”.

A close and effective coordination between the participating actors led to the successful completion of all project phases by summer 2020 in accordance with the defined technical and qualitative requirements, time schedule and costs. The systems are now operational in the artillery units under the designation PzH 2000M, a self-propelled howitzer, initially manufactured by KMW/Rheinmetall for the German Army and now in service in a further five NATO states.

**Agueris & RUAG Defence France Chosen to Manufacture SCORPION Vehicle Simulators**

(jr) The Directorate General of Armaments (DGA) has awarded the RUAG Defence France and Agueris consortium the SERKET tender for the development, production, commissioning and support of cabin simulators with a realistic and kinetic environment for tactical training on army armoured vehicles.



Photo: RUAG Defence

RUAG Defence France, a subsidiary of RUAG Simulation & Training and RUAG International, is a major player in the supply of simulation systems and equipment for training land forces. Agueris is the French subsidiary of the John Cockerill Group and specialises

in training simulation and this win comes after a competitive selection process.

Operation SERKET entails developing and supplying the next-generation technical and tactical simulator kits needed for training the armed forces on the new SCORPION programme hardware comprising the JAGUAR and GRIFFON combat vehicles and modernised LECLERC tanks. Military schools and regiments will be provided with flight and turret training as well as crew and unit training.

**First PIRANHA V Delivered in Romania**

(jr) The Romanian Ministry of Defence has acquired the first of 36 PIRANHA V wheeled armoured vehicles manufactured in Switzerland by General Dynamics European Land Systems (GDELS-Mowag). The vehicles will be handed over following the acceptance test at the Mechanical Plant Bucharest (Uzina Mecanică București, UMB).



Photo: GDELS

In 2018, the Romanian Ministry of Defence ordered 227 PIRANHA V vehicles in six different configurations. The contract, with a value of €850M, provides for the vehicles to be manufactured within the scope of a strategic cooperation and technology transfer between GDELS-Mowag and UMB. In November 2019, the production of the further 191 vehicles started at UMB, with UMB employees having been at GDELS during the production of the first vehicles.

The 8x8 PIRANHA V is the latest development of GDELS’ widely used PIRANHA series. The 33-ton vehicle is powered by a 480 kW diesel engine and the infantry variant has an Elbit UTR30 Mk 2 turret. The cabin is protected as standard to level 4/4b according to STANAG 4569 and offers space for a crew of three (driver, commander, gunner) plus eight soldiers. A special feature is the hydro-pneumatic suspension of all eight wheels. Denmark is the first user of the PIRANHA V, having inducted it in 2017, while Spain and Switzerland have respectively ordered 348 and 32 examples.

**Schiebel Pacific Expanding in Australia**

(jr) Schiebel Pacific is scaling its business up in preparation for Land129 and Sea129,





Photo: Schiebel

### Sovereign

Andrew Watson, General Manager at Schiebel Pacific said: "We are growing our footprint in Australia as we're confident that the demand for our CAMCOPTER® S-100 will continuously grow. Therefore, we are investing substantially in not only creating Australian jobs but also the transfer of knowledge and skills to Australia and the wider region. Just as important, we are increasing our network of local SMEs, to make sure we are aligned with the Australian government's policies on Australian industry content." The Vertical Take Off and Landing (VTOL) UAS CAMCOPTER® S-100 is a proven and reliable TUAS for Intelligence, Surveillance and Reconnaissance (ISR) missions. With its small footprint and ability to operate from confined areas, it needs no prepared area or supporting equipment for take-off and landing and it can be set up and ready in 20 minutes. The S-100 operates day and night for up to ten hours and has globally collected more than 100,000 flight hours so far.

with the company hiring remote pilots and maintenance technicians while upgrading its facility. The expansion comes after Schiebel Pacific and Raytheon Australia teamed up for the LAND129 Phase 3 Tactical Unmanned Air System (TUAS) project for the Australian Army. Additionally, Schiebel Pacific is ramping up in preparation for the upcoming SEA129 Phase 5 for the Royal Australian Navy (RAN).

Should the team be awarded the Land129 Phase 3 TUAS contract, Schiebel's world-class CAMCOPTER® S-100 will be produced by Schiebel Pacific at a new Australian production facility, which is currently being established. One defined goal is to establish an in-country sovereign Australian training capability to deliver tailored training solutions for the Australian Defence Force's (ADF) requirements on land and at sea. Schiebel is currently under contract with the RAN, which operates several systems at 822X Squadron, Nowra, New South Wales.

### ■ US Fighter Offer to Finland

(JC Menon) The US has given approval for Finland to buy air-to-air missiles, air-to-ground precision guided munitions and related equipment for an estimated cost of US\$12.5Bn, should the country decide to

purchase 64 F-35 aircraft. The proposed sale will replace Finland's legacy F/A-18s HORNETS and enhance its air-to-air and air-to-ground self-defence capability. The package is broken down into:

- 66 Pratt & Whitney F-135 engines (64 installed and 2 spares)
- 500 GBU-53/B SMALL DIAMETER BOMB II (SDB II) All-Up Round (AUR)
- 12 GBU-53/B SDB II Guided Test Vehicles (GTV); 12 GBU-53/B SDB II Captive Carry Vehicles (CCV)
- 150 SIDEWINDER AIM-9X Block II+ (Plus) Tactical Missiles
- 32 SIDEWINDER AIM-9X Block II+ (Plus) Captive Air Training Missiles (CATMs)
- 30 AIM-9X Block II+ (Plus) SIDEWINDER Tactical Guidance Units
- 8 AIM-9X Block II SIDEWINDER CATM Guidance Units
- 100 AGM-154C-1 JOINT STAND OFF WEAPON (JSOW-C1) Tactical Missiles
- 200 JOINT AIR-TO-SURFACE STANDOFF MISSILE-EXTENDED Range (JASSM-ER) AGM-158B-2 Missiles etc.

The proposed sale of F-35s with associated missiles and munitions will provide Finland with a credible defence capability to deter aggression in the region and ensure interoperability with US forces, according to a State Department spokesman.



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The prime contractors will be Lockheed Martin, Pratt & Whitney Military Engines, The Boeing Company, and Raytheon Missiles and Defense. This proposal is being offered in the context of a competition and if it is accepted, it is expected that offset agreements will be required. Any offset agreement will be defined in negotiations between the purchaser and the contractor(s).

### ■ Meteor Aerospace Tests ORCA USV

(Arie Egozi) Israeli defence company Meteor Aerospace has successfully completed a series of sea trials with its ORCA Unmanned Surface Vehicle (USV). The trials were held in Israeli waters, demonstrating ORCA's technical and operational capabilities, including autonomous unmanned operation, use of its various mission payloads and high speed intercepts of a maritime target. The ORCA trials were remotely

Photo: Meteor Aerospace



monitored and controlled from a shore based Ground Control Station.

ORCA is an 8 ton, 13 metre long boat, built from composite materials that can be either unmanned, or operated by a crew of two. It can attain speeds of 60 knots and has an operational range of 700 nautical miles while an on-board diesel electrical generator enables ORCA to stay at sea for long duration. Missions for the system include patrol, interception and engagement of suspect craft, off-shore intelligence gathering and search & rescue. For these missions, ORCA carries a maritime radar, an array of Electro-optical day and night sensors, a stabilised Remote Weapon Station (RWS) with a long range gun, a directed projector, a loudspeaker and microphone system.

In its unmanned mode, ORCA is either fully autonomous with automatic obstacle avoidance, or is remotely controlled from its Ground Control Station. Meteor Aerospace develops and produces advanced unmanned defence systems, including the IMPACT-700 and IMPACT-1400 UAV systems, the ORCA USV, the RAMBOW Unmanned Ground Vehicle and several types of long range precision strike missile systems.

### ■ UK MoD Awards Bridging Contract to WFEL

(jr) WFEL has received a new contract from the UK MoD to supply 17 Sets of its Medium Girder Bridges (MGB). This follows a review of the MoD's modular gap crossing capabilities, which aimed to draw together existing in-service capabilities into a single coherent capability.

These 17 new MGB bridging sets can be configured in several different ways to provide flexibility to the Commander on the ground. Configurations include concurrent deployment of both a 31-metre Double-Storey and a 5-bay Single-Storey version. The bridging systems will be deployed by the Royal Engineers and are available for use in both Military Operations and Emergency Disaster Relief scenarios.

The contract, worth more than £46m, will not only provide continuing employment for 50 direct WFEL production-related personnel but is likely to create an additional 15 to 20 skilled and production support jobs. It is also estimated that it will secure a further 100 jobs in the supply chain in the North of England and Scotland.

#### Widely Used

With over 500 systems already supplied to militaries around the world, the MGB is a modular military bridging system which has already been adopted by many NATO members. MGBs were deployed in Norway during Exercise Trident Juncture 2018, one of the largest NATO exercises of recent times.

Photo: WFEL



In 2018, the Australian Defence Force (ADF) also took delivery of several new MGBs, under its Land 155 programme, replacing those previously in service for over 30 years. The ADF chose double-storey, link-reinforced Medium Girder Bridge variants, spanning up to 49 metres, supplemented by additional portable Pier and Span equipment, allowing bridges of up to 76 metres to be constructed. MGB Walkways were also supplied, ensuring

the bridges could be used in any civil emergency or disaster relief situation.

Land 155 also saw delivery to the ADF of WFEL's 46-metre 120 MLC DSB Dry Support Bridges, which can be launched by just 8 personnel within 90 minutes. The DSB allows a level of inter-operability with an ever-growing user base, proven in the field as temporary infrastructure in Iraq and Afghanistan.

### ■ Replacement Cockpit for EUROFIGHTER Synthetic Training System

(gwh) The Pilot Synthetic Training System (PSTS) for EUROFIGHTER pilots will be modernised and expanded by upgrading the two full mission simulators and cockpit trainers in Laage, Germany to meet the latest technical and tactical requirements. Alongside this, two additional full mission simulators will be provided, and ten cockpits in the full mission simulators and cockpit trainers will be exchanged at all German EUROFIGHTER Main Operating Bases.

Photo: Reiser



Prime contractor Airbus Defence and Space has contracted simulation specialist Reiser Simulation und Training (RST) to supply the state-of-the-art cockpits. The contract covers the provision of the two cockpits to expand the training capacity from two to four simulators in Laage and the ten cockpits for the exchange at the German EUROFIGHTER bases in addition to those at the Airbus Central Integration Facility in Manching.

All cockpit replicas will be equipped with a full range of cockpit displays and control panels, including a newly developed fully functional head-up display (HUD). They will also include the RST g-seat motion cueing system, a simulated anti-g inflation system as well as an breathing air system. With the delivery of high-fidelity training systems now ordered, RST continues its long-standing cooperation in the EUROFIGHTER programme. In the last 15 years the company has developed more than 30 cockpits and delivered them to all Eurofighter user nations.

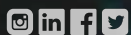
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DEFENSE



### ■ First Training Ship for Qatar Launched

(kö) AL-DOHA (Hull Number QTS 91), the first of two Naval Cadet Training Ships (CTS) for the Qatari Emiri Naval Forces (QENF) has been launched in Istanbul during a ceremony attended by Turkish Defence Minister Hulusi Akar and Qatari counterpart Khalid Bin Mo-

Photo: author



ammed Al Attiyah. This comes after Turkish shipbuilder ATIK was awarded a contract by the Qatari Armed Forces on 13 March 2018 during DIMDEX 2018 to build two CTSs for the QENF. The vessels have an Offshore Patrol Vessel-like design and production started on 25 February 2019, with the second ship to be delivered in 2022.

With a crew of 35 men, the ship will enable 76 cadets to receive combat and weapons training. The AL-DOHA is equipped with an additional 30mm Stabilised Gun, 2 12.7mm Machine Guns are also capable of secondary missions such as offshore patrol missions. The ships are almost 90 metres long with a 12.9 metre beam and a full load displacement of 1,950 tons. The ships have a draught of 4 metres and can reach a maximum speed of 22 knots, something made possible by two diesel engines with 3600 kW each. AL-DOHA also has a helipad for a medium sized helicopters at the stern.

### ■ 1,000 Unprotected Logistics Trucks for the Bundeswehr

(gh) The Bundeswehr is accelerating the renewal of its truck fleet with funds from the Corona economic stimulus package. Rheinmetall will deliver 150 HX2 trucks in the 5-tonne payload class with 6x6 chassis and 850 HX2 trucks in the 15-tonne payload class with 8x8 chassis. The contract-value is €398M, with the trucks scheduled to be delivered in 2021 and 2022. This comes af-



Photo: Rheinmetall

ter the Defence and Budget Committees approved the bill necessary for investments from the stimulus package of over €100M on 7 October 2020.

A further 1,000 trucks can be called up from the current framework agreement with Rheinmetall MAN Military Vehicles (RMMV) of 2017, which was designed for 2,271 vehicles, of which 1,870 trucks have already been ordered and over 1,000 are delivered. This will replace trucks whose procurement dates back in part to the 1970s.

#### Versatile

In addition to the trucks, 1,850 swap bodies are also to be procured from the funds of the economic stimulus package for €48M. This will give the unprotected transport vehicles a body that can be replaced relatively easily, meaning troops can quickly adapt the trucks for different transport tasks. Under two contracts, 950 15-foot swap bodies and 900 20-foot swap bodies will be procured for use from 2022.

It was also announced that a further 401 trucks are to be procured from the existing framework contract at a later date and it is also foreseeable that more unprotected transport vehicles will be needed to fully cover mobility needs. The Bundeswehr estimates its further requirements in the coming years at around 300 trucks with a payload of five tonnes and around 3,000 trucks with a payload of 15 tonnes. These projects are also to be dealt with in parliament this year.

In addition, the Federal Office of Bundeswehr Equipment, Information Technology and In-Service Support concluded a framework agreement with RMMV in June 2020 for the procurement of swap body systems for 4,000 protected and unprotected trucks in the 15-tonne payload class (ZLK) with a term of seven years. Interchangeable loader systems are trucks with removable load carriers (interchangeable loader platform), as known from the Mechanised Handling, Storage and Transport Integration (MULTI) truck. The load carriers can be loaded on the ground.

#### Ongoing

Rheinmetall MAN Military Vehicles' (RMMV) robust, all-terrain HX2 8x8 vehicles are distinguished by their high degree of mobility, even off-road, and can optionally be equipped with a protected cab. The core equipment is the hook loader developed by Hiab, with which the associated interchangeable loader platforms (flatracks) can be quickly picked up and set down. In addition, the vehicles can also pick up a swap-body or container via the standardised 20-foot ISO interfaces.

The first tranche of 230 protected and 310 unprotected vehicles was called up when the framework agreement was signed. The con-

tract value is around €360M and by the end of 2022, the force is expected to received up to 75 protected and 90 unprotected swap body ZLK 15-ton trucks. The vehicles will thus be ready in time for deployment with NATO's VJTF 2023 (Very High Readiness Joint Task Force).

### ■ Handheld NINOX 40 UAV Launched

(Arie Egozi) Israeli company SpearUAV has unveiled its handheld version of the NINOX 40, an encapsulated drone system which offers instant launch and provides

Photo: SpearUAV



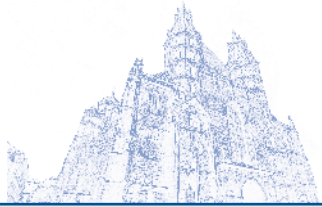
immediate intelligence capabilities to any tactical unit. The company claims that with this unique launching system, the NINOX 40 can provide advanced capabilities to various law enforcement agencies. Examples include:

- police, for use in public safety and law & order applications
- prison services, for the management of any disorder or prison break attempt
- border guards – for situational awareness and securing sensitive infrastructure

The system comprises an encapsulated drone and control unit which is launched at high speed before the drone immediately unfolds and stabilises in the air, with no operator intervention required. Specifically designed for single-user operation and weighing under 250 g – within regulatory limitations – it is lightweight enough to be carried in the soldier's vest during combat. Advantages include:

- Mission flexibility – NINOX 40 handheld systems can be carried by any number of users in a unit, according to mission requirements, delivering full ISTAR capability without being dependent on any other weapon or special equipment.
- Safe and intuitive – the NINOX 40 handheld is easy to use without any special training.

The NINOX 40 Handheld has a flight endurance of up to 40 minutes, extensive ISTAR capabilities, day and night camera for enhanced situational awareness, automatic tracking, and can be launched on the move and from under cover.



# Viewpoint from Vienna



## Observations around Austrian National Day

Georg Mader

This year, 26 October marked the 75th anniversary of the adoption by Austria's Parliament of the constitutional law by which Austria declared "its

permanent neutrality" and undertook not to join any military alliance. At the same time, the date also commemorates the withdrawal of the last Allied soldier from the four occupation powers from Austrian soil. Austrian National Day has since become something of a traditional occasion, with hardware of the Austrian Federal Army (Bundesheer) showcased to the public and where hundreds of new recruits are ceremonially sworn in. This year, due to the COVID-19 situation, the events were limited to a virtual occasion which saw only 12 soldiers swearing their oath of allegiance symbolically.

Just days before this year's anniversary, a survey which involved 1,500 citizens was published, revealing that slightly more than 50% of respondents would not take up arms in defence of their homeland. Looking at the survey's results differently, the key finding will not exactly motivate the country's political leadership to address the issue of funding for the military, even if extra funds to the tune of €300M were already agreed upon in 2018 and earmarked (from 2022) for the eventual replacement of the 55-year old ALOUETTE helicopter fleet with 18 AW149M aircraft in a G2G deal with the Italian Government. Not to mention the €200M added to the defence budget for 2021. These painfully small improvements need to be seen against a sum of in excess of €10Bn for multiple types of equipment - and infrastructure - backlogs, which have accumulated ever since the withdrawal of the Allied forces in 1955 when a whole range of equipment was donated by the departing powers, something which created a tragic and long-lasting mind-set of "non-spending." Aside from the fact that the nearly 50 remaining (ex-Dutch military) LEOPARD A4 tanks still require night vision sensors or even modern ammunition, or that there has been zero investment for more than 20 years in the "skeleton" of the remaining 3.5 cm AAA, it is the Air Force with its prohibitively expensive painted active air-surveillance component of 15 single seater EUROFIGHTER TYPHOONS, as well as the non-replacement of the SAAB-105OE trainers (from the 1970s), that have prompted the harshest headlines. While the small fleet of TYPHOONS are still performing flawlessly, though expensive to operate due to the moderate flying hours allotted, a years-long legal case initiated by the MoD and the Federal Financial Procurement Agency against Airbus (formerly EADS) for apparently "cheating" Austria between 2003 and 2007, was quashed only this year. Nevertheless, the new Defence Ministry leadership, under the first



Photo: Georg Mader

*An Austrian Saab 105OE*

female minister, Klaudia Tanner, still miss no opportunity to publicly express how much they want to get rid of them – and after just 13 years of service. The defence service has since identified three GAF operated EF two-seater aircraft that would ease the burden of the truly expensive OCU-hours at Rostock/Laage. Officers have told ESD that with upgrade investments of approximately €200M (especially on an all-weather/night IRST), this would solve the problem for a period of 15 years. The political MoD-administration is closing ranks in the face of - ill informed - public opinion, and does not even wish to talk to Airbus. Instead in a rather bizarre constellation just days before this year's 26 October commemoration, they received Indonesian Defence Minister Prabowo Subianto in person, who had sent a letter in the spring announcing Jakarta's intention to "buy", the 15 TYPHOONS for the TNI-AU (Indonesian Air Force), despite the fact that Vienna - due to its end-user certificate – cannot in fact "sell" the aircraft in any case without prior approval from Airbus, the EF-consortium, NETMA or the ITAR-involved USA. Some observers have told ESD, that SAAB is still patiently waiting with 14 to 18 "GRIPEN" C/D MS20s. All this is taking place in light of the fact that the SAAB-105 will be retired from service next year, without being replaced. Most jet training from levels III to V will have to be conducted in Lecce (Italy) and the above-mentioned Laage air base. Costs of training pilots abroad amount to nearly €7M per pilot. Something that is not mentioned publicly, a new basic/advanced jet trainer is nevertheless still being pursued, according to information from the Czech Republic. In a G2G proposal, 500 annual hours on the two-seater L-159T1/T2s at the Czech Air Force base in Caslav was offered recently. And if Austria were to somehow "re-unite" on this model, together with NATO neighbours Hungary, the Czech Republic and Slovakia - as signalled to ESD - and revisit the historic period long before 1955, this might go some way to easing the country's self-imposed inferiority complex.

# The Enduring Franco-Egyptian Defence Partnership

**David Saw**

France has always been fascinated by Egypt, from Napoleon's expedition to Egypt which had both military and scientific missions (modern Egyptology was one of the results), to more visible manifestations of this fascination, such as the Luxor obelisk (gifted to France in 1832) and located in the Place de la Concorde in the centre of Paris.

**M**ove across the river from Concorde and you will come to the Quai d'Orsay, the French foreign ministry; here there is also a fascination about Egypt, but one that is totally focused on the present rather than the past.

Obviously, France is a major European power, but it is also a Mediterranean power. Clearly, Egypt is central to the security architecture of the eastern Mediterranean, but Egypt is also very important in terms of the broader Middle East and North Africa (MENA) region. One should also not forget the continuing importance of the Suez Canal as an artery of world trade.

With a population of slightly over 104 million, Egypt has the 14th largest population of any country in the world. It has the third largest population in Africa and it has the largest population of any Arab country. These population numbers alone indicate why a stable Egypt is essential to the MENA region and adjacent areas.

## An Economy in Distress

This large population is also one of the key factors that destabilise Egypt. Some 95% of Egypt's population live in 5% of Egypt's land area, the fertile zone along the River Nile. The

Photo: Dassault



**The Egyptian Air Force was the first export customer for the Dassault RAFALE. Previously, it had been the first export customer for the MIRAGE 2000. Egypt acquired 16 RAFALE DM (two are shown here) and eight RAFALE EM aircraft.**

problem here is that increasing population is leading to migration to the major urban areas such as Cairo. The Egyptian economy cannot grow fast enough to provide these people with jobs. Although unemployment is estimated at some 12%, it is most likely much higher, and while it is claimed that some 27.8% of the population live below the poverty line, these figures are almost certainly undercount the true level of poverty.

One way to escape this poverty and lack of economic opportunity is to become an overseas worker, and millions of Egyptians have taken this path. The vast majority (some 75%) work in the Middle East. The remaining 25% have looked to become permanent economic migrants in countries such as the US and Canada, as well as Britain, France and Italy in Europe. Consequently, remittance income from these migrants has become an important source of foreign currency for the Egyptian economy.

As to the domestic Egyptian economy, it is mired in inefficiency and corruption, and is still recovering from years of being centrally planned by the state. Egypt needs Foreign Direct Investment (FDI) and it needs a strong and responsive private sector in its economy. Unfortunately, it is a long way from obtaining what it needs in this regard. In the meantime, to keep popular discontent under control, Egypt continues to subsidise bread prices and the price of fuel. However, the ability of the government to keep increasing

Photo: via author



**The ENS GAMAL ABDEL NASSER helicopter carrier heading to Alexandria after a joint naval exercise with the French Navy, October 2016**

subsidies on bread and fuel is diminishing and that will inevitably affect the internal security situation.

For France, it is imperative that Egypt remains stable. In their view, if Egypt falls into chaos dire consequences will be felt all across the MENA region. For example, the Egyptian border with Libya extends for 1,115 kilometres, and Egypt is playing a vital role in trying to bring stability to what otherwise would be well on the way to becoming a failed state. Then there is the border between Egypt and Gaza. It is only a small border, some 13 km, but there is no love lost between the Hamas regime in Gaza and the present Egyptian government. It should also be mentioned that Egypt is a draw for economic migrants from across Africa and the Middle East, who seek to use the refugee resettlement programmes that Egypt has with the West. According to the CIA World Factbook, "Cairo has one of the largest urban refugee populations in the world."

**Internal Threats**

Egypt also has to face multiple internal threats. These include an Islamic State



Photo: Naval Group

**ENS ANWAR EL SADAT (L1020) was the second MISTRAL class to enter service with the Egyptian Navy, being commissioned in September 2016. The first unit, GAMAL ABDEL NASSER (L1010), was commissioned in June 2016. These two LHDs have vastly enhanced Egyptian amphibious capabilities.**

linked grouping operating in Sinai, al-Qaeda, and other Islamist groupings and groups linked to or inspired by the Muslim Brotherhood. Egypt's current President, Abdel Fattah el-Sisi (took of-

fice June 2014), is perfectly aware of the danger these internal threat represent. He was previously Minister of Defence and Commander-in-Chief of the Egyptian Armed Forces (2012-2014) and prior to



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**EQUIPMENT**



**ARTILLERY SYSTEMS**



Photo: Naval Group

**In February 2015 the Egyptian Navy contracted to acquire a FREMM class frigate from France. This led to the frigate NORMANDIE being built for the French Navy being taken over and modified to meet Egyptian requirements, being commissioned into the Egyptian Navy as the TAHYA MISR in March 2016.**

that was Director of Military Intelligence (January 2010 to August 2012). Terrorism on its own cannot bring down the Egyptian state, but increased political violence and repression allied to economic instability can strip the government of legitimacy and open the door to the Muslim Brotherhood and similar ideological groups.

The Egyptian government and military continues to face a complicated threat matrix, comprising of conventional, asymmetric and internal challenges. France and the other Western powers remain committed to a stable Egypt. In the main, the primary guarantor of stability in Egypt is domestic economic growth

and continuing financial support from the major Arab States.

### The Defence Picture

France took advantage of the overthrow of the Egyptian monarchy in 1952 and the arrival of the new Republican regime to make a significant tank sale. Between 1953 and 1955, some 30 AMX-13 light tanks and 150 refurbished SHERMAN tanks were delivered. After the nationalisation of the Suez Canal in 1956, France and Britain invaded Egypt and irony of ironies ended up in combat against these tanks. After the Suez Crisis, Egypt turned to the Soviet bloc for its weapons sup-

plies and it was only in the 1970s that France became a supplier once more.

The Egyptian Air Force (EAF) has been a solid customer for Dassault. Between 1973 and 1975, the EAF took delivery of 32 MIRAGE 5SDE and six MIRAGE 5SB two-seaters, with the programme financed by Saudi Arabia. A second batch of 14 MIRAGE 5SDE was delivered in 1977, again Saudi financed. A third batch, once more acquired with Saudi money, followed in 1980 and this consisted of eight MIRAGE 5SDE and six MIRAGE 5SDR reconnaissance aircraft. In related contracts a total of 100 R-530 and 180 R-550 MAGIC 1 air-to-air missiles were acquired between 1973 and 1983. A final batch of 16 MIRAGE 5EZ aircraft was delivered in 1983.

Egyptian Air Defence Command also turned to France for equipment, between 1977 and 1985 they took delivery of 16 Thomson-CSF (now Thales) CROTALE air defence systems and 500 missiles. Thomson also supplied radar systems. Between 1974 and 1985, the EAF acquired a substantial number of SA-342 GAZELLE helicopters from Aerospatiale (now Airbus Helicopters). The first batch consisted of 54 helicopters, 24 of which were for the anti-tank role equipped with HOT missiles, the second batch consisted of 36 helicopters of which 30 were assembled in Egypt. Incidentally, the Egyptian Army acquired the MILAN missile system from France. Other French missiles acquired included the AM-39 EXOCET and the OTOMAT in both ship-launched and coastal defence formats.

The next wave of EAF acquisitions saw them acquire the ALPHA JET. In total, 45 of these were acquired in the early 1980s, of which 37 were assembled in Egypt. There were 30 MS-1 trainer versions and 15 MS-2 light attack versions. At one stage, it had been hoped to build large numbers of ALPHA JET for both the EAF and friendly Arab air forces, but financial and political problems saw that idea fail to materialise.

On the other hand, the EAF became the first customer for the Dassault MIRAGE 2000, acquiring 16 MIRAGE 2000EM and four MIRAGE 2000BM two-seaters, with all aircraft delivered by 1988. They also acquired a wide stock of air weapons, including MAGIC 1 and Super 530D air-to-air missiles, AS-30L and ARMAT anti-surface/anti-radiation missiles and the ATLAS targeting pod. Originally, the EAF had wanted to double the size of their MIRAGE 2000 fleet with a second batch order, but it was unable to obtain the necessary funding. Egypt



Photo: Naval Group

**ENS El Fateh (971) was the first of a class of four GOWIND 2500 class corvettes built for the Egyptian Navy. In total four corvettes were acquired, the first was built at Lorient in France, with the remaining three units built at the Alexandria Shipyard in Egypt.**





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can acquire equipment from the US on military aid and FMS terms, it can attempt to get financial assistance from Saudi and other Arab countries or it can hope for generous financial terms from suppliers, which are rarely forthcoming. France could sell more to Egypt, but it has to be very clever on how it constructs funding packages and the fact of the matter is that Egypt is not a wealthy country.

### Major Programmes

The overthrow of the Muslim Brotherhood-linked Morsi regime in 2013 opened up a new range of possibilities for Egypt. Support flowed in from friendly Arab states. In terms of defence equipment, France was able to achieve a decisive breakthrough in meeting the defence needs of Egypt by negotiating across 2013 and 2015 a wide ranging series of acquisition programmes and making these a reality through the construction of a major defence financing programme. In June 2014, a contract valued at €1Bn was signed covering the supply of four GOWIND 2500 class corvettes. The first of these was built at Lorient in France and

delivered in September 2017, the other three corvettes were to be built in Egypt at Alexandria Shipyard with the first unit launched September 2018. In December 2018, Naval Group established a subsidiary in Alexandria, Alexandria Naval for Maintenance and Industry, which will be responsible for the maintenance and support of Naval Group vessels in service with the Egyptian Navy. More naval contracts followed. In February 2015, Egypt signed up for a FREMM class frigate. The unit in question was the NORMANDIE originally destined for the French Navy, modified to meet Egyptian requirements and renamed as the TAHYA MISR. The frigate was commissioned in the Egyptian Navy in March 2016. Then came the acquisition of the two MISTRAL class LHDs that had originally been built by France for Russia, but were subsequently embargoed, at which point Egypt stepped in to purchase the two LHDs, plus associated landing craft. The first unit, GAMAL ABDEL NASSER (L1010) and the second, ANWAR EL SADAT (L1020), were commissioned into the Egyptian Navy in June and September 2016. The EAF also benefitted from this profusion of contracts with France and be-

came the first export customer for the Dassault RAFALE, signing for 16 RAFALE DM (two-seat) and eight RAFALE EM (single-seat) aircraft and a complete package of MBDA air weapons, as well as the Safran AASM PGM. Originally, the EAF had been discussing the acquisition of between 24 and 36 RAFALE, in the end opting for the lower number. Adding to the RAFALE fleet is certainly something that the EAF would be interested in. The limiting factors are competing priorities and, of course, funding. If France can generate another attractive funding package, more RAFALE are certainly possible. Turning once more to the Egyptian Navy, the original GOWIND 2500 contract contained options on two more corvettes that have never been realised. Undoubtedly, Naval Group continues to pursue this opportunity, although reports indicate that Italy has just won a contract for two frigates from Egypt. In the final analysis, Egypt has been a strong market for France in recent years. However, further expanding market share depends as much on the financial packages on offer to the customer to support a purchase, as on the quality of the equipment. ■

## SWARM System

WB Group's SWARM system integrates two UAS systems into a highly capable reconnaissance and strike unit, providing highly accurate observation and target selection by the FlyEye UAS, and rapid strike response using the WARMATE loitering munition with its 70 minutes endurance. SWARM has been developed for forces needing a combined, wheeled or tracked vehicle-mounted reconnaissance and strike system. Data and voice communication between the vehicles is facilitated by the FONET system, combined with software defined VHF radios. A variant of the TOPAZ integrated combat management system (ICMS) is used for C2.

SWARM comprises reconnaissance and command vehicles (RCVs) equipped with the FlyEye UAS and strike vehicles (SV) which carry the WARMATE loitering munition. The UAVs provides precise reconnaissance data that is immediately used by strike drones to engage. The system is designed for a number of Warmate loitering munition can simultaneously attack various targets. Along with SWARM, WB Group also offers a comprehensive UAS and support vehicle maintenance support programme. The company also offers an excellent training programme. The typical SWARM system, mounted on customer-supplied 4x4 vehicles, uses the RCV equipped with ground control station and ground data terminal. Three Fly-Eye UAVs are stored inside, ready for rapid deployment. The RCV can follow the UAV to increase the operational surveillance range. The SV enables the transportation and deployment of 20 sets of WARMATE loitering munitions. The WARMATE's selection of warheads (high explosive or thermobaric, with day/night camera) and components are stored separately in a protective capsule. The SV is also equipped with ground control stations and catapult launchers allowing immediate deployment of WARMATE, on command.



Graphic: WB Group

## Strong Partner for New Key Technologies



Images: Diehl Aerospace

**Dr Gerardo Walle is the CEO of Diehl Aerospace**

For years, Diehl Aviation has established itself as a leading first-tier supplier for civil and military aviation in Germany. From this position, it is obvious that the business unit Diehl Aerospace, as an avionics specialist, is fully involved in defining the future European air combat system, in particular, the Next Generation Weapon System (NGWS). The aim is to take responsibility for the German share, together with the European partners, for the development of highly complex networked systems in the field of avionics.

### FCAS as a Contribution to European Security

FCAS is Europe's most modern and complex defence programme for decades to come. It is to be implemented as a networked interconnected system of future weapon systems, manned fighter aircraft, unmanned systems such as drones as well as already existing platforms. FCAS strategically safeguards Europe's security and defence sovereignty in the long term.

### Great Technological Expertise

Since the beginning of 2020, the FCAS project has been in the demonstrator phase which is expected to continue until 2026. This should be followed by initial flight tests of a demonstrator of the Next Generation Fighter (NGF). Diehl Aerospace has already contributed strongly to the project thanks

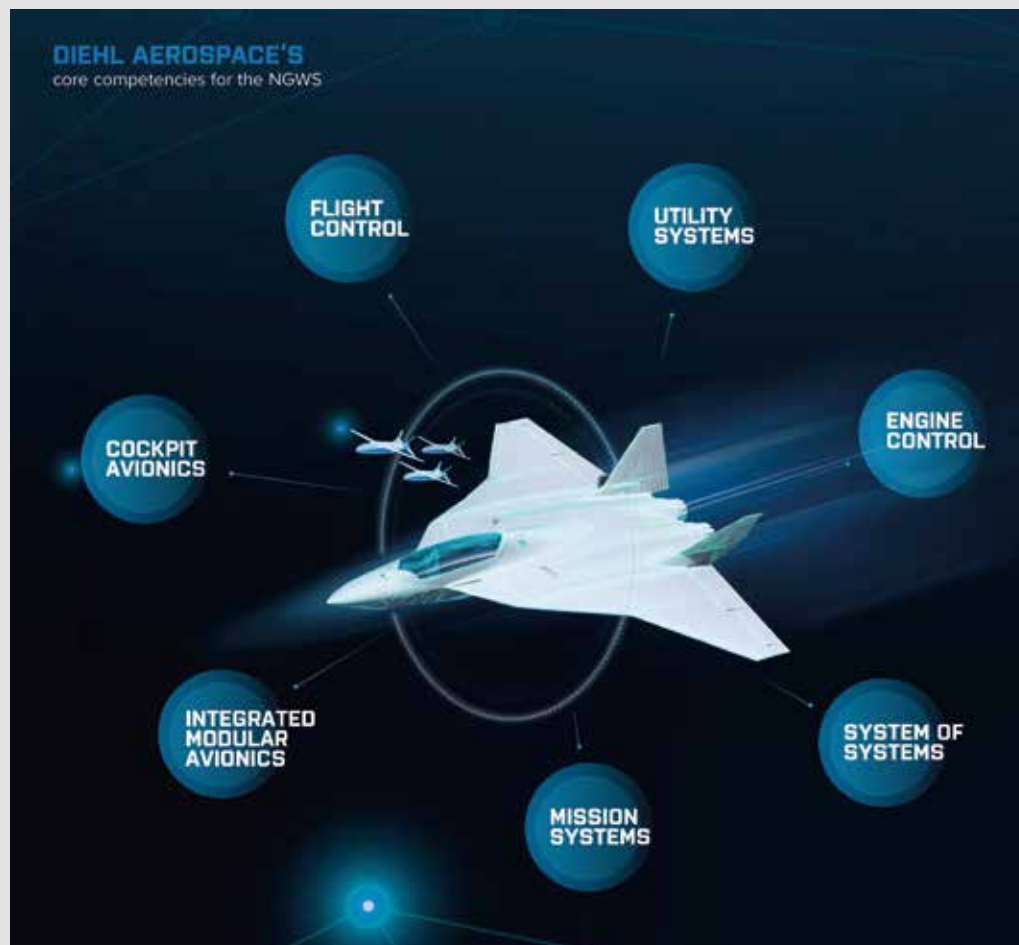
### Diehl sees avionics as the central nervous system of the Next Generation Weapon System

to its extensive expertise in avionics and aircraft systems as well as its experience in international cooperation. "We want to continue to make our technological expertise available for FCAS in the future. This applies in particular to the development of integrated modular avionics, complex flight control systems and cockpit avionics, as well as to other systems in the fighter aircraft and remote carriers," Dr. Gerardo Walle, the CEO of Diehl Aerospace GmbH, confirms.

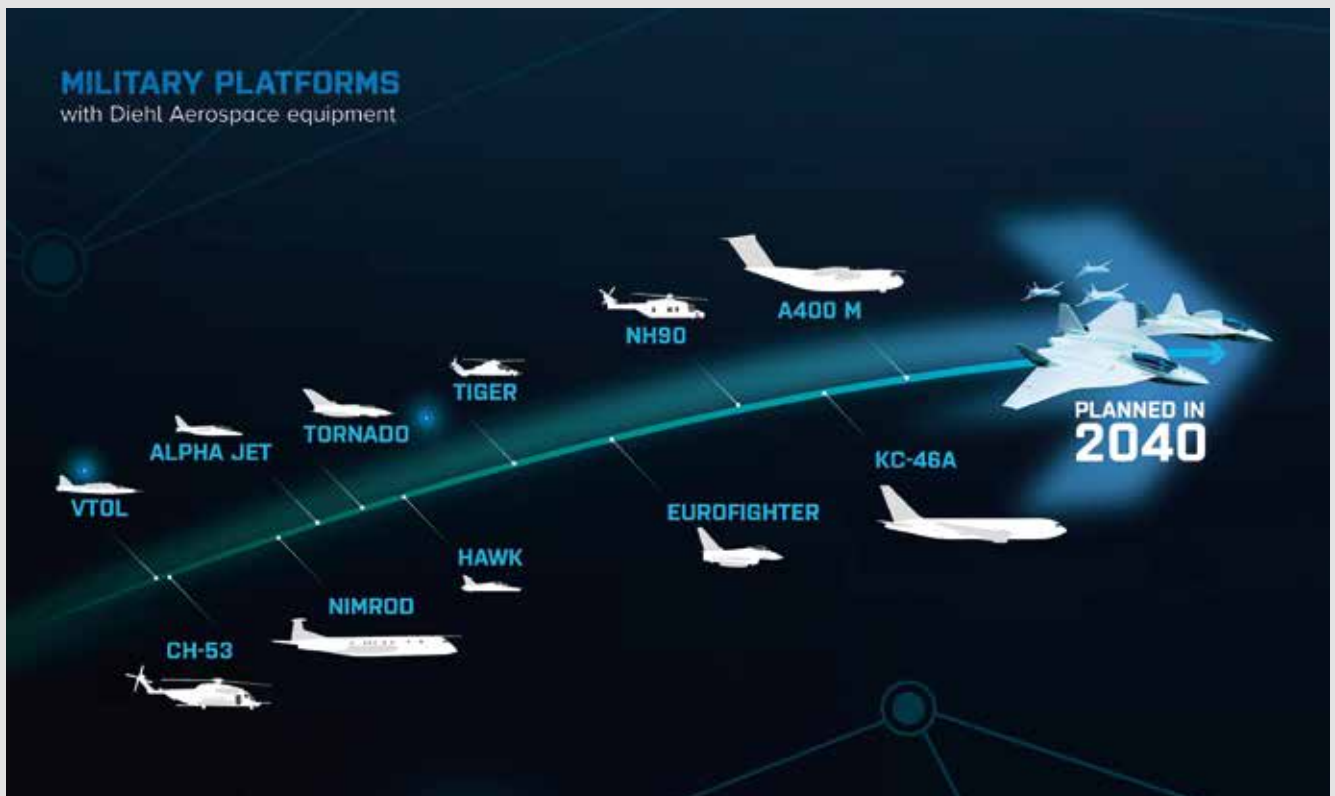
the highest requirements in terms of performance and will have to cope with enormous amounts of data. This is because mission- and situation-relevant information must be obtained from a wealth of raw data in real time, which requires extremely powerful computer systems. This data must be merged or linked and analysed intelligently, must be available at all times and must be absolutely secure. The use of artificial intelligence will also become more important. Avionics thus plays a crucial role in the architecture of the fighter and in the performance of the weapon system as a whole. This makes it all the more important to understand avionics as a central nervous system and to consider it as an essential element in the overall concept from the outset.

### Avionics as the Central Nervous System of the NGF

The FCAS system is part of the Next Generation Fighter, a sixth-generation fighter aircraft. The new fighter aircraft will meet



# Marketing Report: Diehl Aviation



*Diehl Aerospace can refer to significant expertise gained from numerous commercial and military aviation programmes*

## Extensive wealth of experience

The future air combat system requires special know-how and many years of experience in the development of highly complex electronic systems. Diehl Aerospace meets these requirements – in both civil and mili-

tary aviation: The company not only played a large part in the development of avionics-systems of modern passenger and transport aircraft, but together with European partners, was also involved in the development and serial production of avionics and equipment systems for the Tornado, Eurofighter, NH90, Tiger and Airbus A400M

aircraft. As a joint venture with Thales, the company is also well positioned in the context of European cooperation. This expertise will now also be taken advantage of for the development of the latest technologies for Cockpit Avionics, the Flight Control System and the Integrated Modular Avionics of the NGWS.

## Cockpit

The development of the cockpit for the NGF is a major challenge, as new concepts and technologies need to be implemented. The cockpit must be developed around the pilot, from both an operational and ergonomic perspective. The cockpit is equivalent to the command centre for all NGWS systems. The use of artificial intelligence will play a central role in effectively pooling, filtering and visualising large amounts of information. The pilot is significantly freed up and supported in planning and execution his/her mission – for example by recommending actions and prioritising tasks with a flexible degree of automation. This keeps the pilot in control of his/her aircraft, the assigned flying platforms, and the mission. The cockpit will use the latest concepts and technologies, such as the HOTAS

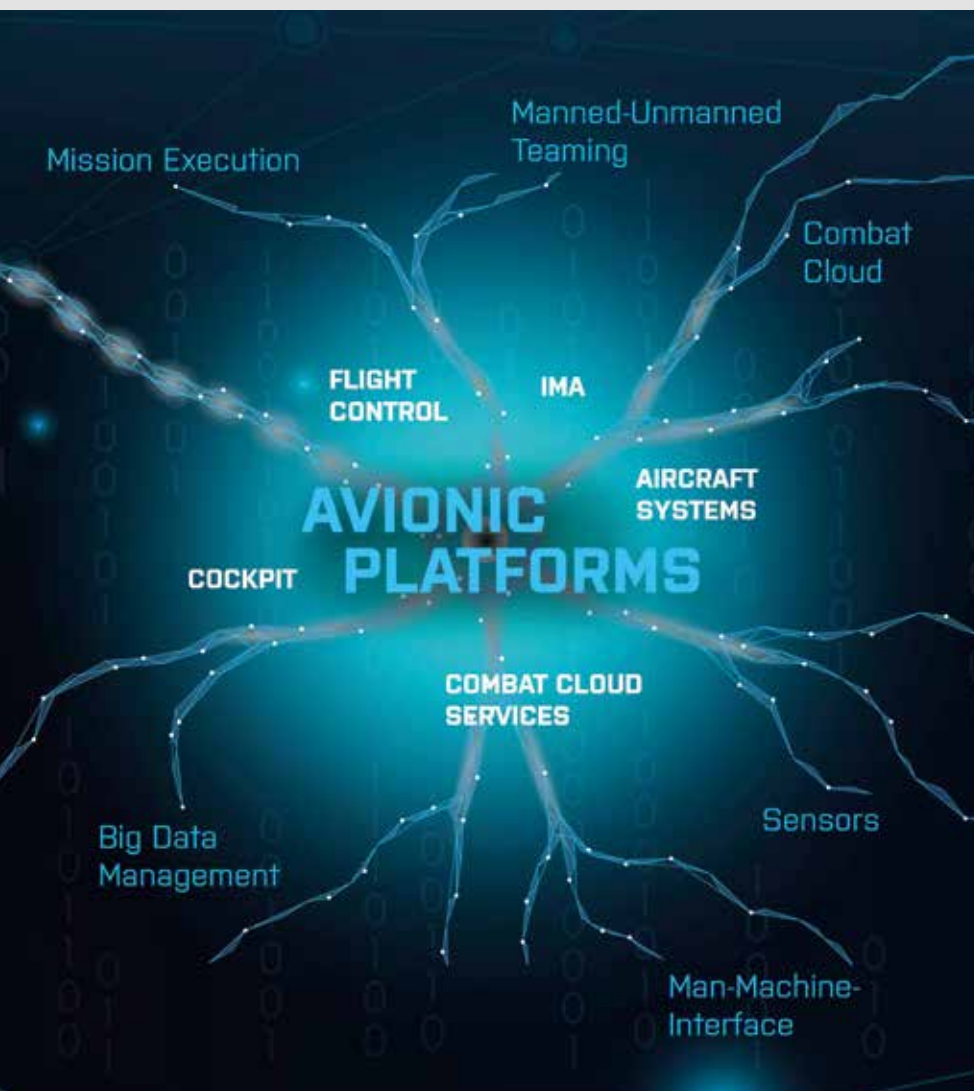
control concept, touch screens, innovative displays controlled by voice control, as well as gesture and eye movement detection. The most important data is integrated in real time with the helmet and head-down display. The pilot thus has all relevant information in his/her field of vision at all times. Using special sensors, the pilot can switch between augmented reality and virtual reality applications and visualise all tactical information as well as the situational image. The latest generation of curved, high-resolution and high-contrast multifunction displays provides the pilot with an intuitive and ergonomic display of all the information required.

## Flight Control

Special requirements are also placed on the flight control of the NGF and its

system integration into the aircraft architecture. In addition to the engine, a “digital flight control system” is a core element of the NGF and is therefore crucial for the required performance in various operational profiles. An integrated, multifunctional platform is best suited to meet the high flight characteristics and performance requirements of the NGF.

A future flight control system could be implemented on an interoperable, functionally segregated platform where flight control, thrust vector control, flight management and autopilot functions can be integrated. Other functions could be conceivable as well: The range extends from calculating air and flight data to autonomy functions such as taxiing, take-off, landing and air-to-air refueling.



*Diehl Aerospace's technological expertise is centred around integrated modular avionics, complex flight control systems and cockpit avionics.*

### Integrated Modular Avionics (IMA)

Diehl Aerospace also has many years of expertise in the development and production of integrated modular avionics: the first generation of IMA is used as a military variant specifically tailored to the Airbus A400M. The second generation of IMA was developed for the Airbus A350. The flexible and decentralised system uses high-performance core processing computers CPIOM and remote data concentrators cRDC to extend system capabilities for critical security.

The third generation of the IMA platform is already in development and will soon be ready for the FCAS demonstrator phase. It offers even better functionalities compared to previous generations. Agile development after iterative-incremental

processes has continuously increased the performance of the latest IMA platform. This allows it to be used for a wide variety of applications and run multiple applications at the same time. Due to its modular structure, even more subsystems can be integrated, as required, with shortened commissioning procedures. The latest generation of IMA comes with fewer subsystems, thus saving costs, mass and volume and requiring less platform redundancy.

### Utility Systems

Both Diehl Aerospace as well as Diehl Aviation have a wealth of expertise and an extensive portfolio in the field of aircraft systems:

This ranges from Doors Control Monitoring System for electronic control and moni-

toring of the cargo ramps and doors of the Airbus A400M to fuel indicators, level generators, fuel pumps and fuel computers on Eurofighter and Tiger aircraft. This expertise can also be used specifically for the NGF and the remote carriers, for example in the area of weapon bays, which must be moved and positioned with particular precision in a Next Generation Fighter. In addition, many aircraft systems can be implemented on the new IMA platform, such as the steering system for the landing gear of the Airbus A400M.

### Air Combat Cloud

An air combat cloud should allow all systems involved in a mission (such as NGF, RC, and legacy platforms) to securely share raw data, information, and resources. A distributed cloud-based solution combined with a service-oriented approach enables efficient and redundant delivery of information, protected against cyber attacks. In addition, it is extremely robust against failures and easily allows for the integration of new components.

Diehl Aerospace can also contribute its many years of experience in the development of modern data networks in aircraft and information distribution systems to the Air Combat Cloud. For example, corresponding services can be provided using avionics: this applies to processing large amounts of data during information collection and also to managing the data flow, taking into account real-time requirements, availability, reliability and security.

### FCAS as a driver for Innovation

Already today, Germany has outstanding military aircraft manufacturing capabilities. Consistent development of these capabilities in the scope of the FCAS programme not only promotes competitiveness, but also helps Germany to sustainably strengthen and expand existing key technologies. In addition, FCAS enables spill-over effects for future civilian applications. Many technologies can also be used for commercial aerospace of the future.

"At Diehl, we have the know-how and experience to play a decisive role as an avionics lead, to develop technologies and systems, to deliver products and to define their specifications. This will meet the high demands placed on the FCAS system as a whole," says Gerardo Walle.

# Indonesia Searching For a Defence Direction

**David Saw**

**A glance at the map would quickly demonstrate how complex the task of defending Indonesia is made by its geographical realities.**

It is the world's largest archipelagic state and according to official figures there are 13,466 islands in the archipelago, of which only 922 are permanently occupied. It also holds a strategically important position as it sits on top of the Straits of Malacca, one of the most important oil choke points in the world, and the Sunda Straits and the Lombok Straits, both of which link the Indian Ocean and the Java Sea.

With a population of just over 267 million, it is the fourth largest country in population terms, it is also the largest Muslim-majority nation. Over 87% of the population are Muslim. Despite this large population, the Indonesian Island of Java is one of the most populated areas in the world, only the Amazon has more forestation than Indonesia. Sadly, Indonesia suffers from illegal deforestation and the burn-off of these illegally logged areas creates a major pollution problem and not just in Indonesia. Neighbouring states such as Singapore and Malaysia experience a persistent smoke haze from the burning.

It must be noted that environmental issues, such as deforestation/illegal logging, are becoming a significant issue in Indonesia. In the cities, there is air pollution, major problems with waste management and pollution of water resources. Elsewhere maritime resources such as fishing grounds are being over-exploited. A lot of this is inevitable, a direct result of a growing economy and the resultant urbanisation. However, at some point an Indonesian government is going to have to do something to deal with these issues. At this point we are still, in the main, dealing with quality of life issues. Into the future, though things become more serious and you are dealing with major health and social impacts.

While dealing with human-inspired problems is certainly a growing concern, Indonesia also has plenty of problems to deal with due to its geographical location. Foremost amongst these are the threat from volcanoes and earthquakes, both on and offshore. Indonesia has more volcanoes

Photo: Defence Australia



**Back in 2003 the Indonesian Air Force (TNI-AU) acquired two Sukhoi 27SK and two Su-30MK aircraft, followed by a second batch of three Su-27SKM and three Su-30MK2 in 2008. Finally, six Su-30MK2 arrived in 2013. Plans to purchase the Su-35 have not been finalised as yet.**

than any country in the world and some 76 are thought to be active at present. As a result, the Indonesian government and military must make contingency plans and set aside resources for dealing with natural disasters, which sadly are never really that far away. The devastation caused by the 2004 earthquake and tsunami shows how bad these incidents could be.

## Politics and Economics

Indonesia's political structure has determined its economic performance and it is only in recent years that the economic potential of the country has been allowed to flourish. Indonesia declared independence in 1945, but it was only at the end of 1949 that the Dutch colonial power withdrew after a bitter struggle. There was a democratic interlude, but President Soekarno then transitioned to authoritarian rule by playing off the various factions in the country – Islamists, Communists, nationalists and even the military – against one another.

In 1965, the military under Major General Suharto swept away the Soekarno regime, although he remained as president until dismissed in 1967. This was the beginning of what was called the New Order regime, with Suharto as president that would last until 1998, when Suharto was forced to resign in the midst of an economic crisis, where his ability to manage the various political, economic and military factions failed. Fundamentally, the Guided Democracy of Soekarno and the New Order of Suharto failed to deliver economic uplift to the mass of the Indonesian population. In 1998, Indonesia would embark on the path to a democratic political system in the midst of a domestic and regional economic crisis. The fact that Indonesia is still a democracy some 22 years later and that there has been significant economic progress is a great achievement. There is still much to be done though. The Indonesian government is currently facing a number of destabilising factors that might have very dangerous consequences.



Photo: Damen

**RADEN EDDY MARTADINATA (331) is the lead ship of a class of two MARTADINATA frigates, Damen SIGMA 10514, assembled by PT PAL in Indonesia for the Indonesian Navy (TNI-AL). The TNI-AL had previously acquired four DIPONEGORO, SIGMA 9113, class corvettes from Damen.**

Once again, Indonesia is in the midst of an economic crisis, but this crisis is not one of its own making. According to the World Bank, "The COVID-19 pandemic and associated containment measures triggered the deepest global recession in eight decades." The World Bank Indonesia Economic Prospects study, released in July 2020, noted that the Indonesian economy was hit by severe external and domestic shocks. Real Gross Domestic Product (GDP) growth fell from five percent year-on-year in the fourth quarter of 2019 to three percent in the first quarter of 2020, the lowest growth since 2001.

The impact was felt across the economy. Private consumption slowed heavily, spending on investment reduced, commodity prices declined and there was a broad-based decline across many sectors of the economy. Sectors that suffered most included manufacturing, construction and what the World Bank calls "low value-added sectors including transport, storage, hotels and restaurants, sectors that employ a large number of workers, all saw a near halving in their sectoral growth rates from Q4 2019." The World Bank expects zero GDP growth by Indonesia in 2020, but is projecting a recovery in 2021.

At time of writing, the number of COVID-19 cases in Indonesia amounted to 396,454 and deaths numbered 13,512 or a mortality rate of 3.41%. Significantly, the testing rate is only 15,992 per million of population, indicating the possibility of a significant undercount in the number of cases. Even so, within Jakarta many of the movement restrictions imposed earlier in the COVID-19 crisis have now been relaxed. A positive sign indeed, yet the low testing rate remains a concern.

Although Indonesia and many of its regional neighbours might be projecting cautious optimism over COVID-19 infection and recovery rates, elsewhere in the world the picture is certainly not positive at this time. Impacts on the travel, tourism and hospitality sectors in Indonesia are high. The heavily tourism-dependent island of Bali remains closed to tourists until 2021; they had hoped to re-open in September until a localised COVID-19 infection spike was detected. Tourism is an important source of foreign currency and employment to Indonesia. Even assuming that the country will re-open to tourism, the numbers of tourists will be massively reduced compared to pre-COVID-19 levels and the resulting economic consequences will be severe.

As with other countries around the world, the Indonesian government has responded to the COVID-19 crisis with increased

spending to support the economy through this difficult period. Whether the package of measures deployed by Indonesia will be enough remains to be seen. Perhaps fortunately, the current president Joko Widodo (often called Jokowi), won re-election for a second five-year term in 2019 and has stated he has no intention of attempting to further extend his term in office. He therefore should have enough time to helm Indonesia's recovery from the COVID-19 crisis and hopefully put the national economy back on a growth track.

One of the significant things about Jokowi was that he did not come from the Indonesian political or military elite. Many of those who will attempt to be his successor will come from these elites. Add that to the already fractious nature of Indonesian politics and the next presidential election in 2024 could get very complicated. Furthermore, manoeuvring to improve political positions prior to that election could hamper the work of the current government in the last two years of its term – all of which means that the next few years are not looking to be that encouraging in terms of political stability.

## The Defence Environment

As might be imagined, the COVID-19 crisis will inevitably have an impact on Indonesian defence spending plans. With defence budgets already under pressure, Indonesia's procurement programmes will be even harder to predict. If you look back to the Suharto period despite being a military-dominated regime they really did not spend an awful lot of money on procurement. There certainly was a lot of focus and investment on what were known as the 'strategic industries,' an indigenous defence industrial base, and some quite



Photo: Defence Australia

**Under the PEACE BIMA SENA II programme the US supplied Indonesia with 19 F-16C and 5 F-16D Block 25 aircraft upgraded to near Block 50/52 standard and six surplus airframes for spares use. The aircraft were delivered between 2015 and 2017.**

Photo: Indonesian Armed Forces



**The Indonesian Korps Marinir (Marine Corps) comes under the control of the Indonesian Navy (TNI-AL) and has made significant purchases of the BMP-3F. The first 17 arrived in 2010, a second batch of 37 in 2014 and a third batch of 22 in 2019.**

impressive capabilities were developed. Yet, on reflection one could hardly classify this local defence industry as a resounding success.

Post-Suharto the Indonesian military had all sorts of equipment from diverse suppliers, much of which was becoming unaffordable. Matters were not being helped by the fact that Indonesia was subject to an EU arms embargo and to a more damaging US arms embargo that remained in force until 2005. Another factor that hampered Indonesian defence planning and acquisition was a lack of funding. To make things happen they had to find suppliers prepared to offer generous terms or they had to look for a mix of cash and commodity barter, such as palm oil.

When arms embargoes came to an end and the Indonesian economy started to grow, all of a sudden people rediscovered an Asian state in a strategic position that also happened to be the world's largest Muslim country. And then, almost as if by magic, everybody was fascinated by Indonesia for all sorts of political, economic and strategic reasons. This allowed the Indonesian military to deal with some of its spares shortages to get legacy equipment back into operational service. At the same time, they were finally able to embark on a defence modernisation programme to make up for years of under investment in defence.

Having the ability to restore your existing fleet to operational status and be in a position to finally modernise should have

been a very positive experience for the Indonesian Air Force (TNI-AU). In reality, it turned out to be much more difficult than expected. The primary TNI-AU combat asset were the 12 Lockheed Martin F-16A/B Block 15 OCU aircraft acquired under the Peace Bima Sena I programme and delivered in 1989/90. The plan was to purchase an additional nine F-16A aircraft in 1996, but this was cancelled by Suharto in favour of acquiring 12 Sukhoi Su-30K from Russia. Then came the fall of Suharto and the economic crisis and that programme stalled.

Then in 2003, there was an unusual deal in which Indonesia acquired two Su-27SK and two Su-30MK aircraft, with both being delivered the same year. It took until 2008 for another Sukhoi order to materialise, this time covering three Su-27SKM and three Su-30MK2. Deliveries were in 2009/10 and eventually in 2012 six Su-30MK2 were acquired, with the aircraft delivered in 2013. The next phase in the Sukhoi saga was to be the acquisition of the Sukhoi Su-35. Eleven aircraft were to be purchased in a contract valued at US\$1.1Bn, of which US\$570M was to be paid in commodity barter and additionally there was an offset requirement of 35% of the contract value. This contract appeared to be on course for ratification back in 2018, but since then no activity has resulted.

The US then returned to the picture as ties with Indonesia improved during the Obama Administration, leading to the signature in 2011 of the Peace Bima Sena

II programme. Between 2015 and 2017, the TNI-AU would receive 19 F-16C and 5 F-16D Block 25 aircraft upgraded to near Block 50/52 standard, as well as six Block 25/Block 15 airframes for spares use. In addition, the F-16A/B Block 15 OCU fleet would go through the FALCON STAR upgrade programme.

The TNI-AU is now working towards the acquisition of an advanced combat aircraft and with the Su-35 purchase making no progress, they are looking at other options. There was a suggestion that they might look to acquire more F-16s, but earlier this year there were apparently discussions with France on a defence package that might include RAFALE and naval units. More recently interest has been expressed in the 18 Tranche 1 Eurofighters that are currently in use with the Austrian Air Force. Finally, for the TNI-AU there is Indonesian participation in the Korean KF-X future fighter programme. In 2010, Indonesia agreed to provide 20% of the development funding and would look to purchase up to 50 aircraft eventually. The anticipated in-service date is post-2030.

While the TNI-AU appears to be operating a haphazard procurement process, in contrast the Indonesian Navy (TNI-AL) appears to be much more focussed in this regard. In terms of headline programmes they have acquired two MARTADINATA class, SIGMA 10514 frigates, from Damen in the Netherlands, with the frigates assembled by PT PAL in Indonesia. This followed on from the earlier acquisition of four DIPONEGORO class, SIGMA 9113 corvettes, from Damen. The TNI-AL had operated two Type 209/1300 CAKRA class submarines since 1981, they added to this capability in 2011 with an order for three Improved CHANG BOGO class (Type 209/1400) submarines from Daewoo Shipbuilding and Marine Engineering (DSME) in Korea. Known as the NAGAPASA class, two units were built by DSME in Korea and the third by PT PAL in Surabaya. This was followed in 2019 by an order for a second batch of three NAGAPASA, with all units to be built by PT PAL.

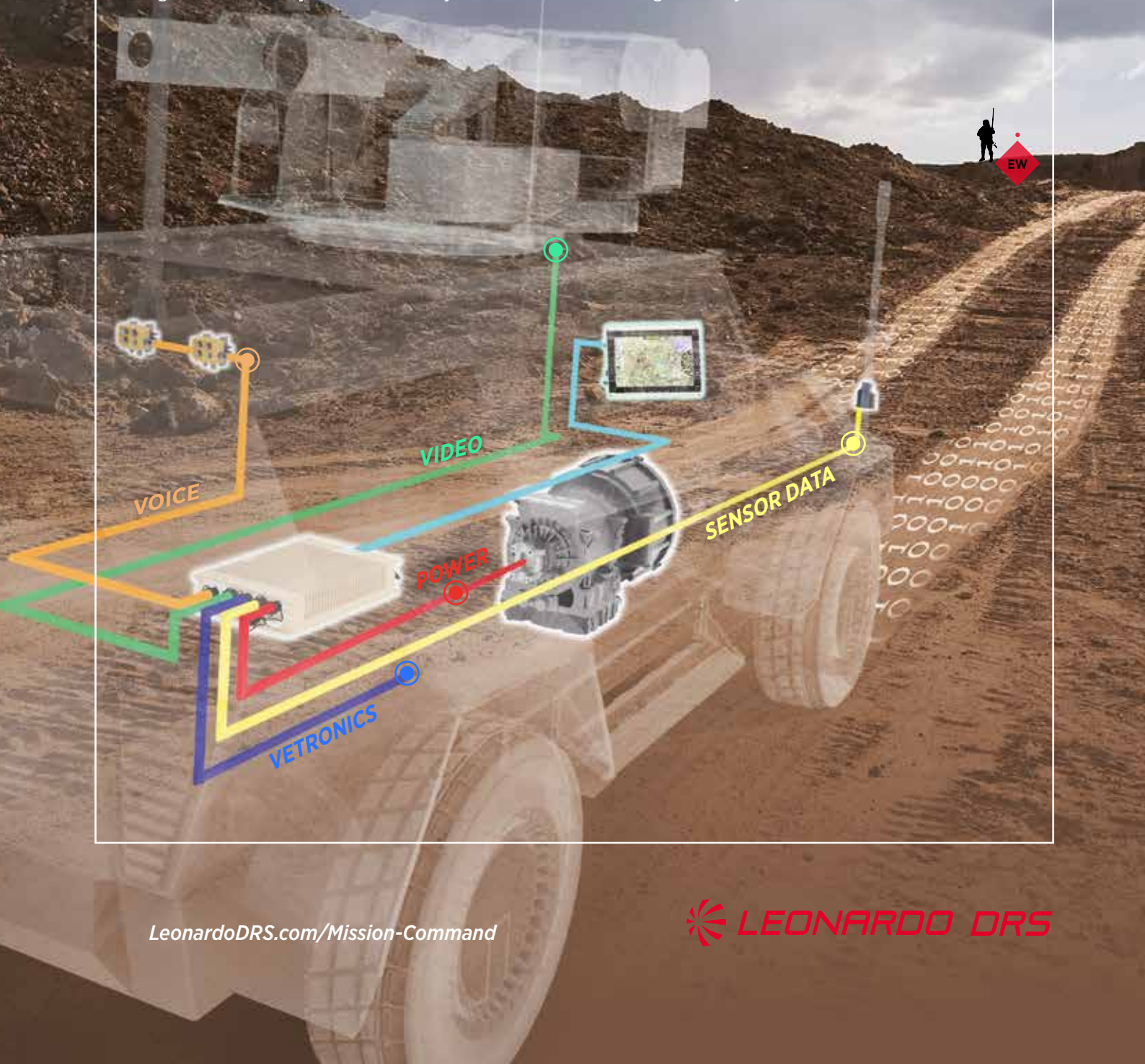
To conclude, the Indonesian economy will rebound post-COVID-19 and this will create an environment where the Indonesian military can continue with its modernisation plans. However, as our look at procurement in the TNI-AU demonstrates, there is a real requirement to develop long-term planning and procurement skills and not just buy small batches of aircraft from all over the place. In this regard, the TNI-AL appears, to an extent, to be much better managed in terms of procurement. Despite all of this, Indonesia is and will remain an important defence market. ■



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# Germany as a Strong Player in Security Policy Environment

Rolf Clement

German security policy will always be firmly embedded in an alliance with friendly countries. Since the Second World War, this principle has been the mantra of first West German, and later on, an all-German security policy. This is how the Bundeswehr was conceived upon its founding as an alliance force. The then Federal Republic did not build up its new armed forces until it had already become a NATO member.

Cold War, Germany is no longer a front-line state, but lies instead at the heart of alliances, both NATO and the EU. This is especially true geographically. Politically though, Germany should be one of the leading powers in both alliances. But Germany does not always play the role it could. For example, Germany does not have a central document in which the country's interests are clearly defined. Although the 2016 White Paper concerning the Bundeswehr and the security of the Federal Republic of Germany contains some references to this, there is no clear orientation.

supply of medicines was limited within just a few weeks. Has anyone actually thought about the fact that a halt in production or delivery might also be politically motivated?

## Economic Interdependencies

It is only now that the discussion surrounding economic dependencies is taking on a different emphasis. Is it really true that NORTH STREAM 2 will increase the dependence on Russian gas supplies? Or should we involve China in the design of digital infrastructure?

Photo: BAKS



The current "White Paper on Security Policy and the Future of the German Armed Forces" was tabled in July 2016. It provides guidelines for Germany's security policy.

Image: ES&T archives



The objective of the NORTH STREAM 2 pipeline project is to enable direct Russian gas supplies to northern Germany. The project has been subject to international criticism, above all by the Trump administration.

This approach has played a decisive role in making Germany a respected partner in many parts of the world today. Germany's economic strength, coupled with an appropriate, though not excessive, and cautiously deployed military power, in tandem with an often very committed diplomacy, constitute the value of German foreign and security policy. Some time ago, a former Foreign Minister of Poland, which had suffered particularly badly from German aggression during the Second World War, said that he now preferred a strong Germany to a weak one. This is a fine compliment indeed for German policy.

## Germany's International Environment

But is Germany sufficiently engaged in world politics? There are legitimate doubts surrounding this issue. Unlike during the

Every German government pursues the goal of enabling the German people to live in freedom and prosperity. But it is not very popular to publicly portray economic interests as elementary. In Germany, many people – including those in positions of responsibility – live in the certainty that business has very little to do with security policy. In Germany, many people find it immensely difficult to keep an eye on the many different policy areas. To name one example: Germany's pharmaceutical industry (like those in other European countries) has moved almost all of its production to China for cost reasons. After the 2020 pandemic brought production in China to a standstill, the

Germany is a country without its own raw materials. It is dependent on transport routes for raw materials to its own country, for finished products to other countries – and increasingly also on products that German companies produce more cheaply in distant countries. In contrast, the contribution of German naval forces to the freedom of global sea routes is comparatively insignificant. This is an example of how Germany has failed to make the right choices over the past three decades. After the collapse in the confrontation with Warsaw Pact countries in 1989/1990, Germany – like many other countries – demanded the so-called peace dividend. In November 1990, the

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Heads of States of most European countries, USA and the Soviet Union met at the CSCE Paris Summit, agreeing to the institutionalisation of the Organization for Security and Co-operation in Europe (OSCE) and on the historic "Charter of Paris for a New Europe." The political consequence of this landmark document was the implementation of massively reduced numbers and equipment in the armed forces of the signatories. When it became clear, however, that the world would not be so peaceful after all, Germany's armed forces also concentrated on engaging in operations to stabilise peace wherever this was deemed possible and necessary – in Bosnia and Herzegovina, Kosovo, Afghanistan, the Gulf region, off the coast of Somalia, and in the Mediterranean off Lebanon.

Photo: US Navy



**German forces in Afghanistan. In the scope of the ISAF mission (2001 – 2014) Germany was the third-largest provider (after the US and the UK) of military troops to the country.**

## A Change of Course

Only with the Russian annexation of the Crimea in 2014 did this awareness become stronger again, that old political reflexes, especially those of Russia, were still valid. Russian policy overall is geared towards expansion, and Germany and its allies in NATO and the EU need to respond to this. In Germany, too, there is an unfinished de-

bate as to whether the admission of countries from the former Eastern Bloc to NATO has promoted, and even fueled this Russian policy. This argumentation is wrong. What would the European continent look like if NATO had rejected membership for these countries at the time? The rift would be politically much deeper and would run geopolitically along Germany's eastern border. The enlargement of NATO and the EU to the east was therefore in Germany's

best interest, both politically and militarily. It has also certainly helped to stabilise the continent.

Following the annexation of the Crimea and the relevant decisions taken by NATO at the summits in Warsaw and Wales, the Federal Republic changed its policy permanently. Since these two meetings, Germany has conceptually implemented NATO's new approach with the White Paper 2016 and the redirection of personnel and arma-



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ments policy. This change of course is significant. It could hardly have been clearer – time and again there is news that the defence industry, for example, cannot supply more than the current budget estimates. Objectively speaking, current achievements are unsatisfactory. Everyone concerned with the security of Western Europe and the Euro-Atlantic Alliance would like to see stronger and better equipped armed forces in the Alliance. But let us not delude ourselves: problems exist in all countries. It is only that the Germans seem to be discussing them in public.

The problems of German security policy do not lie so much in the laborious accumulation of material capabilities. That takes time after the peace dividend phase. The problems lie in the political sphere. Since Germany does not want to act alone, the politicians in Berlin quickly turn their attention to Brussels, where they can cause a real disaster. But that is only true to a certain extent.

It is certainly true that no uniform perception of threats currently exists in the EU and NATO. There are countries that perceive Moscow's policies as threatening, for example – Poland and the Baltic states chiefly among them. Germany's position is rather more nuanced. On the one hand, there is concern that Russia gives the impression of expansive plans even beyond the Crimea. On the other hand, there is a tendency to think that it would be possible to enter into negotiations with Russia and regulate matters for the better. Confrontation would be useless. Experience has shown that Russia only understands clear language and responds to the need for harmony with others with clear announcements. That is why German foreign policy often seems to be without contours.

Anyone hiding behind an ambiguous EU policy should actually do everything possible to make that policy as consistent as possible. Is Germany always as loyal to the Alliance as we expect others to be?

When Germany ceased using nuclear energy, there was no consultation with her EU partners. From just one day to the next, a major EU player unilaterally changed the previous plans for a European energy policy. The construction of NORTH STREAM 2 is rejected by a large majority of EU countries. But Germany is moving ahead with the project for national reasons, even though there has been some talk recently of stopping it in connection with the alleged poisoning of Russian opposition leader Alexei Navalny. The people in the Kremlin were right: the Germans talk a lot, but talks are not followed by action.



Image: MBDA

**FCAS – the Future Combat Air System – is only one of numerous multinational armament projects with German involvement.**

### Foreign Influence

It is only now that many in Germany are becoming aware of what the Chinese policy of recent decades has achieved. Whether problems in the supply chains running through China can be solely attributed to the corona pandemic remains to be seen: Germany, too, has underestimated the subtle Chinese policy aimed at expanding its influence. Now China, through economic measures, enjoys enormous influence not only on the EU as a whole, but also on Germany, so much so that there is no longer any threat of its own interest policy being disrupted from here. China has achieved great influence on the economic success of Duisburg's inland port. China is building a large battery plant in Thuringia with the support of the state government led by the local Left Party. Through infrastructure investments in Greece, Italy, Spain and other countries on the EU's eastern border, China has so much influence that the EU could no longer react effectively if China were to intervene in Hong Kong. A foreign policy that is value-driven, that can also act decisively and meaningfully if the values it represents are trampled underfoot, is no longer possible here.

According to government documents, German foreign policy should be conducted in a value- and rule-based order. The fact that some EU Member States do not base their own policies on the values that Germany sees in international agreements (UN Charter, EU Treaty, NATO Treaty, etc.) is triggering a debate. However, real politics also prevents Germany from consistently representing these values. For example, conditions prevailing in NATO partner country Turkey, attract much criticism in Germany, but official relations are maintained because Turkey, with its crucial role in migration and refugee policies, can exert direct influence on Germany's domestic policy: if Turkey allows refugees to continue on their journey towards Europe, they can destabilise the domestic political situation in Germany. The degradation of the rule of law in Poland and Hungary is also more likely to burden the discussion in Germany than real policy towards these countries.

German policy relies heavily on diplomatic conflict resolution. The deployment of the military is in fact only seen as a last resort. This is an attitude certainly rooted in history. In this respect, Germany differs from partners such as the USA, France and Great Britain, who are all prepared to use the military at an earlier stage in the escalation of

Photo: Bundeswehr



**Germany regularly participates in joint exercises with partners from the Alliance. Shown here are boarding teams of the German Sea Battalion and the Netherlands Marine Corps or Korps Mariniers.**



a crisis. This was evident in Afghanistan, in Mali and also in the Middle East, where Germany was cautious, at least at the beginning of operations. This is often justified by the fact that the Federal Government needs a positive vote of the Bundestag for each deployment. However, this is sometimes an artificial argument. If the Federal Government really wants to implement a certain measure, it will seek and achieve a majority in parliament. There has been no case where the parliament has rejected a corresponding motion by the government. But this parliamentary reservation serves the purpose of considering such proposals very well.

### Armament Cooperation

The integration of German policy in international organisations means that joint armament projects are also being considered. Hardly any major project can be implemented under sole national responsibility. That would be too expensive. Moreover, the various countries have different technological backgrounds, which makes cooperation almost mandatory. Germany has repeatedly provided the impetus to develop institutions and procedures for multi-lateral cooperation on armament projects.

Time and again, national interests are encountered in this area, which relate to two aspects: one is the share of value added that each country would prefer to see within its own borders. The other is arms export guidelines, which are particularly narrowly defined in Germany. This is a consequence of the reticence already described. Germany does not want to authorise exports to crisis regions. Even if this is not always enforced, it is a criterion in the question of whether German partners are taken into account in an arms project or whether it is carried out "German free".

### Germany's International Reputation

Below the threshold of wartime deployment, Germany is now one of the largest providers of troops for international missions. In addition, there are numerous training missions, which the police also carry out in many countries around the world. Within the Alliance, Germany is involved in all missions. In securing the Baltic States against a possible Russian attack, for example, Germany provides essential elements and the leadership of the mission in Lithuania. In this respect,

Germany is an internationally sought-after partner despite the attitude described above.

With its military capabilities, Germany is an important component in the NATO Alliance. There is much debate, especially in Germany, about the fact that the Bundeswehr is not fully operational and not fully equipped. Some internal procedures, e.g. with regard to maintenance and logistical support, are indeed in urgent need of reform. But the equipment status is improving steadily. From 1990 to 2014, until the annexation of the Crimea by Russia and the subsequent decisions by NATO, the Bundeswehr had been reduced and converted to serving in international peace missions. Since the Crimea, both national and alliance defence have again been the focus of German defence policy. Since then, considerably more money has been invested and put into systems geared towards defence purposes. Added to this are investments in digitisation, for which the Bundeswehr has established a separate service branch at a level equal to the Army, Air Force and Navy for example. All that glitters may not be gold, but a lot has certainly changed for the better. ■





# Continue and Consolidate Trend Reversals



Photo: ES&T archive

**The COVID-19 pandemic, major procurement programs, budget constraints and international deployments: The German Armed Forces are facing major challenges. ESD had the opportunity to speak to General Eberhard Zorn, the Inspector General of the Bundeswehr.**

**Rolf Clement, the Editor-in-Chief of our German sister journal ES&T, in conversation with the Inspector General – an archive photo from pre-Corona times. This interview was conducted by telephone.**

**ESD:** You have had your assignment as Inspector General for more than two years. What are your most important experiences so far?

**Zorn:** In recent years we have initiated changes and progress in personnel, equipment and finances, and these must be continued and consolidated.

In terms of personnel, we have been on the right track in terms of the number of applicants since last year, both quantitatively and qualitatively. I am satisfied. Like in the civilian labour market, there is a shortage of certain expert capabilities, such as IT staff and technicians.

In terms of equipment, we were able to accelerate a large number of armament projects, including the Multi-Role Combat Ship 180, the NATO helicopter SEA LION, the LEGUAN AVLB and the EAGLE SAN medical evacuation vehicle. The Federal Minister has declared the increase in the "material operational readiness" of our large-scale equipment to be a top priority. At present, it averages a good 70 percent. It is still difficult to keep a clear overview of helicopters and veteran aircraft like the TORNADO and the PUMA infantry fighting vehicle.

We are feeling the consequences of years of cost-cutting, above all in terms of spare parts and our ammunition stocks. This is an issue that I am pushing forward strongly. We need to replenish our depots and warehouses

in a sustainable manner. In the case of unprotected transport vehicles, i.e. standard trucks, we now buy spare parts packages and special tools from the very beginning. Every day about ten brand-new trucks are delivered to the troops – in total there are already more than 1,200 of them. And it is not only trucks that are being delivered, other new equipment items are delivered for service introduction every day.

In essence, it can be summarised under the "Resilience of Forces" heading. One must not only look at the armament project alone, but must also directly consider the follow-up supply. We always did that in the 1980s – during the Cold War. The course has been set for this kind of resilience, and we are continuing to pursue it. We need the 30-day supply.

## Developing Internal Leadership

In addition to the trend reversals, I have been intensively involved with the topic of "Internal Leadership" in the past two years. With programmes such as the "Training" and "Innere Führung" agendas, we have taken up many issues and set up stakes that have been well received by the troops. It is not enough to write concepts, it is also about the troop's mindset. My many visits and discussions with the military authorities show me

that many comrades understand these necessary changes and have already internalised them.

But it takes time to take all people – military and civilian – along in the Bundeswehr. That will continue to be among our tasks.

**ESD:** Do you consider these to be the biggest challenges are for you at present?

**Zorn:** The biggest challenge is still material readiness. We need the appropriate financial backing. New projects, use and stockpiling, these are the key issues that concern me. This also has considerable relevance for the attractiveness of the workplace. They are closely related. By the way, in the current Trendence study, the Bundeswehr was voted second among Germany's most popular employers by over 20,000 schoolchildren. This is both praise and incentive for us.

The second topic to which we have to devote ourselves quite decisively is national and alliance defence. On the one hand, we have to take our soldiers with us internally and on the other hand, we have to communicate it properly to the outside world. We need to engage in a political and social discourse on issues such as: What is threatening us today? In what way do we respond? What do we need armed forces for? Last year, we set up a special ministerial working group. It is under my direct responsibility. My deputy, Lieutenant General Markus Laubenthal, is the Commissioner



for National and Alliance Defence. He coordinates the efforts in this field.

### No Corona Restrictions

**ESD:** In recent months, the Corona pandemic has also had an influence on the German Armed Forces – responding with great commitment and a lot of support for the civilian sector. Has this affected the Bundeswehr's operational readiness in response to its current tasks?

**Zorn:** My answer is a clear "no". We have continued to fulfil our obligations in missions or mission-like commitments. Likewise, pre-deployment training continued in compliance with the relevant hygiene regulations.

However, the order books in the theatres of operation are no longer as full as they were before the Corona pandemic, as training in the areas of operation was largely discontinued by our local partners. Whenever and wherever necessary, we naturally provided advice.

As far as the situation at home is concerned, we have given our support from a standing start – in the sense of administrative assistance – wherever we could provide it legally and in terms of capac-



Photo: Rheinmetall MAN

**Every day, about ten brand-new trucks are handed over to the troops – in total, there are already more than 1,200 units.**

ity. There was no blueprint for the overall pandemic situation. We did it according to what the situation called for. On several occasions I have seen how much commitment and talent for improvisation our soldiers showed in helping.

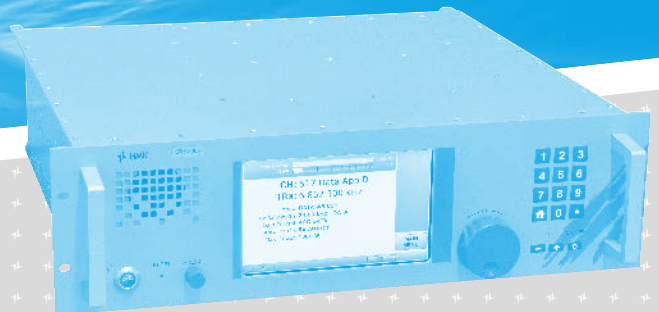
Mission tactics were applied more strongly again, a positive effect of this crisis that makes both me and the troops happy. The Bundeswehr itself has come through the crisis unscathed with a comparatively small number of infected soldiers.

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**ESD:** But: exercises and manoeuvres were cancelled. This has also influenced events in Germany and within NATO. When will it be possible to get the operations and exercises up and running again?

**Zorn:** We will slowly resume operations from the fourth quarter onwards. Starting with staff frame exercises or simulation-supported exercises, where we can easily keep the distance rules etc. We will probably not be able to carry out large exercises until next year.

Pre-deployment training will remain unaffected, it will continue to be carried out unchanged. We are keeping our commitments and promises.

**ESD:** What lessons do you draw from the Corona pandemic for the security policy in general?

**Zorn:** We have to ask ourselves as an integrated society: How resilient are we? From the point of view of the armed forces it can be subsumed under the heading of "overall defence". This includes the stockpiling of vital medical supplies, food, protective masks, tents and camp beds. Coordination in a crisis between the health authorities, civil protection and the Bundeswehr works well. Nevertheless, it will be easier to support each other in the future, for example when stockpiling material, or to clearly define the operational lead.

### International Cooperation

**Zorn:** We must strengthen European co-operation. Germany has carried out re-



Photo: Bundeswehr

**Coordination during the crisis between the health authorities, civil protection and the German Armed Forces works – here soldiers unload protective masks from China, which were transported with the aircraft of the Bundeswehr's SALIS programme.**

lief flights and taken in patients from our neighbours and allies France and Italy. But are we satisfied with this?

China has exerted direct influence in Europe by supporting Italy, which was very badly affected. On the one hand this is a humanitarian gesture. On the other hand, an actor of strategic relevance to the EU has shown that it is he who is quick to support a Member State, while at the same time the impression was created that the European Union itself was slow to act. The EU must ask itself how it intends to deal with such a situation in the future and build up the necessary capacity.

In terms of operational areas, the threat from Corona has not changed. It is still present. Terrorist groups cannot be stopped by a virus. They exploit loopholes and persist in their terrorist activities.

**ESD:** Have you ever calculated whether the two percent target for military spending can be reached more quickly due to the decline in the economy?

**Zorn:** My main concern is to gain substance for our armed forces. It is about our defence mission, about our participation in Alliance missions. Germany continues to stand by the decisions of the NATO summit in Wales.

### Skills Instead of Percentages

**ESD:** Is the two percent target for defence spending still the right benchmark?

**Zorn:** In order to provide the necessary military capabilities, an appropriate armament budget is required. Only then will we be able to fulfil our missions in the long term. I am satisfied with the financial developments of the past years, and of course I would like to see them continue in the future. But it is also clear that we Germans today provide a good ten percent of NATO's military capabilities. That is fair and appropriate.

**ESD:** Do you believe that in the current discussion another increase of the defence budget is realistic?

**Zorn:** We will be well-positioned in terms of making our points, as we were when we drew up the budget at the end of the year. After all, we need sustainable funding for the Bundeswehr and thus also a reliable and substantial increase in the defence budget in order to meet our international commitments. With many of our major armament projects we want to advance European co-



Photo: Bundeswehr

**In the latest Trendence study, the Bundeswehr was voted second most popular employer in Germany by over 20,000 schoolchildren.**





operation. We have to convince Parliament and explain to the public why money should flow into the defence budget in the future, too. Namely, because different crises, such as the Crimean annexation or a pandemic like Corona, have shown us that we must be prepared for a wide variety of scenarios. We are facing up to this discussion.

**ESD:** A number of capital procurement programmes are underway – like MGCS and FCAS. Are there any new priorities?

**Zorn:** MGCS and FCAS are equal projects. The development phase for both has been negotiated with France. These are two major projects of European dimension with a time horizon starting from 2040. However, we must not lose sight of the projects that are to be implemented during the 20 years to that date.

We have therefore launched the corresponding €25 million proposals for the respective projects. Ready-to-use, usable equipment is central to the fulfilment of orders and promotes the satisfaction of our soldiers.

**ESD:** One of the main areas of operation is the Sahel. Are we sufficiently well positioned there? Or do we need more political impetus?

**Zorn:** The current mandates are more robust and cover the entire region. The political impetus has thus been given. By extending its mandate until 2024, the EU has already shown that it has staying power in the Sahel. I see us Germans well positioned there. We want to set up a training centre in Mali that goes beyond our previous commitment in Koulikoro. We want to further improve the operational capability of the Malian forces. Together with the Malian Government, we have been able to identify a suitable location for the training centre in the Mopti Severe region in central Mali. I expect this new centre to be a visible step forward in the quality of training.

Our bilateral military support mission GAZELLE to train Nigerian special forces is a prime example of such a training initiative. The training of Nigerian soldiers has been under way for more than two years. I expect comparable timelines for the training of Malian forces.

Cooperation between the various actors in the region is essential. The EU's cooperation with the UN mission MINUSMA and the G5 Sahelian states as a whole must be intensified.

**ESD:** NATO is now developing a new concept. What do you think should be the main focus?

**Zorn:** The NATO reflection process was launched on German initiative during the NATO 70th anniversary celebrations in London last December. Our former Defence Minister Thomas de Maizière has taken over the chairmanship of the working group.

I believe we are conceptually well placed in NATO. Last year we adopted a new NATO military strategy and launched various conceptual papers. We have re-defined and strengthened the role of SACEUR and thus the role of NATO in Europe. In addition to the new headquarters in Norfolk, Germany has established the new Joint Support Enabling Command in Ulm. This is an important contribution to the defence of the Alliance, which is complemented by our new role as a hub for NATO troop movements in Central Europe.

**ESD:** Thank you!

**The interview was conducted by Rolf Clement.**

## VEHICLE INTEGRATION

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Photo: German MoD/Josephine Klingner

**With the end of the Cold War, Germany's military has been slowly dwindling in size and the country has come under mounting pressure to tackle equipment shortages in its military that fellow NATO nations fear is eroding German readiness. Fixed-wing aircraft, helicopters and other vehicles have been grounded due to lack of spare parts, bringing readiness rates below 50%. German Defence Ministers have pledged to address the shortages and military budgets are now rising again. ESD had the opportunity to talk to Vice Admiral Carsten Stawitzki, Head of the Equipment Department at the German MoD.**

**ESD:** What are your priorities at present?

**Stawitzki:** The top issue that concerns me as Head of the Equipment Department these days is the preparation of the budget for 2021 and the following years. When the budget is adopted in November, we will know whether we can consistently continue the modernisation of the Bundeswehr.

At the moment we are on a very good path. But it is still crucial to make this sustainable. That is why it is important that we can sign many more necessary Bundeswehr modernisation projects before the end of the legislative period next year. This means that they must be approved by Parliament before. My focus is therefore clearly on improving the material operational readiness of existing and weapon systems to be enter service.

**ESD:** Well, you hear different versions for the 2021 budget. Some say that there will be real savings because a lot of money will have to be spent this year. Others say that the 21 budget will definitely run as originally planned because it is an election year. What signals are you picking up?

**Stawitzki:** Of course, the signals here in Berlin are different, depending on whether you ask the governing coalition or the opposition. That is not surprising. Our budget application to the Ministry of Finance has been submitted. Everything else right now is just a glimpse into a glass

ball, which these days is made of milk glass rather than crystal.

More than ever, politicians are called upon to set the broad lines for our society as a whole. What strategic challenges that our society is facing and will continue to face in the foreseeable future does the government intend to address in the coming months and years? This will also give us the room for manoeuvre as a Ministry of Defence to fulfil our constitutional mandate. In any case, I cannot see

any significant improvement in the overall security situation – even on the contrary.

**ESD:** That also applies to the economic stimulus package, which is already underway this year. How will the Bundeswehr be taken into account?

**Stawitzki:** We have made our applications for this as well. All in all, the economic recovery plan is a package. The ten billion euros in the package will be spread across many departments – and that is

Photo: Scania



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what the Federal Minister of Finance is doing. The key point is that the projects should start in 2020 or 2021, if possible, and be cash effective to support industry, but they can also have an impact in subsequent years. We have several promising projects and schemes in the pipeline, but we will have to wait and see.

**ESD:** Can you imagine what the contents are?

**Stawitzki:** The economic stimulus package has set out some guidelines. One is the whole issue of digitisation. Of course, this also affects our department. We can and want to raise additional budgetary funds. Let us take a look at the procurement organisation. Many employees of the subordinate procurement office are now sensibly in the home office – we never expected such a situation and necessity. We had and have to react to the handling of these new challenges first. Then the whole issue of mobility, also for the troops. Here, too, we still have a lot of catching up to do. We want to procure trucks, commercial and, if possible, market-available products that our industrial partners can deliver to us comparatively quickly. After all, anything that would have to be developed first is hardly likely to get a chance in the context of an economic stimulus package in 2020 or 2021.

Then we have projects under the broad heading of research and technology, which we want to tackle more intensively, and the whole complex of infrastructure issues, i.e. the properties of the Bundeswehr.

And under the heading "Promotion of naval shipbuilding" we have submitted a number of other projects. I would remind you of one of the major procurement projects of the Bundeswehr which has already been approved by Parliament, namely the Multi-Role Combat Ship 180 – or the class 126 frigate, as we now officially call it. In this context, a consolidation of the shipbuilding industry is under way. And it is against this background that we have taken another look at the individual naval defence projects. In order to support and revive the economy, can we at the same time support the naval shipbuilding industry in this consolidation process?

**ESD:** What is the material operational readiness and capability of the Bundeswehr at the moment like?

**Stawitzki:** This medal also has two sides. First of all, there are the ongoing deployments. What remains unchanged is that the troops deployed have absolute prior-

ity. First priority is to provide them with the material they need. And that works. The challenge remains to react quickly to failures on a daily basis. The operations are secure. At present, there is no great challenge.

**ESD:** So there is nothing you need to procure quickly?

**Stawitzki:** Nothing that we have not already initiated. One thing that still concerns me is the procurement of the surveillance captive balloon in Mali, which we have secured from our side by the procurement organisation. So we could, contractually speaking, get started. Unfortunately, this is now failing because of airspace coordination in Mali. According to the official justification, the captive balloon endangers its operation due to its location close to the airfield. Ultimately, we wanted to use this technical solution to improve monitoring of the air base. As you can see, some of the problems are not related to the actual procurement.

**ESD:** If you look at NATO's Spearhead in 2023, what else does the Bundeswehr need to be self-sufficient?

**Stawitzki:** At NATO Spearhead, VJTF 2023, we want to learn from the mistakes of VJTF 2019. We will start in 2023 with almost 16,000 soldiers and the corresponding material. For 2019 we had simply started too late to plan and direct the incoming material into those units that were planned for 2019. As a result of this experience, we started the planning process here at the ministry a whole year earlier, after the force deployment had been decommissioned. Then we started to direct the material to the units that are now going to VJTF 2023 so that they can fulfil their mission. There we continue to sail, I say as a naval officer, close to the wind. In the end we will not take the hurdles in all areas as we had imagined. One is what we have signed up for. The other thing is that what is under contract must be supplied by the industry. We will have to put up with some delays, not least because of Corona. And, of course, in the end we will have recourse to replacement material if that becomes necessary!

**ESD:** Can you give me an example of what is not possible due to Corona?

**Stawitzki:** Do you mean specifically for VJTF 2023? It would be too early at this point, because I still have the justified hope that our industrial partners will catch up on this. We were and are in close dialogue. And everyone is aware of what is important.

**ESD:** I sometimes have the impression that people who do not manage to do something say that shortcomings are "corona-related" – as a protective assertion.

**Stawitzki:** Yes, there the picture is very differentiated. Even during the lockdown a number of people – especially large companies – contacted us relatively quickly. By the way, they are contractually obligated to do so under the so-called "Verdingungsordnung für Leistungen". Claims must be notified in order to secure them accordingly. This immediately led to very intensive and constructive talks between the Federal Association of the German Security and Defence Industry and myself, in which we pragmatically adjusted the guard rails relatively quickly with ministerial instructions to the procurement office in Koblenz. For example, we asked ourselves: Can we break contractually agreed milestones in order to accept and pay for partial services already delivered, so as to keep the companies liquid? It remains to be seen how all this develops. As a public-sector customer, we are a very reliable partner for the defence and defence industry these days, while many other business interests have collapsed. My main concern is and remains the fulfilment of the agreed services and not the cancellation of contracts or the skimming off of penalties for delay – on the bottom line, the force cannot take any advantage from that.

**ESD:** Regardless of Spearhead and VJTF: Which major projects do you consider to be time- and financially critical?

**Stawitzki:** I could call any major project that attracts a lot of money financially critical per se. If I take the federal budget, the medium-term financial planning, as a kind of glass box that can be filled, then I can first put boulders in it, then pebbles and the rest with sand – until the whole box is completely filled. The last grain of sand is all that is left over from the money that the budget legislator has given us. If I now take a boulder, a really big project, no pebbles and no sand, and put it on top of it because I want to finance it, then it trickles out when I press the boulder into the sand. In the past, the initial financing of large-scale projects has repeatedly displaced smaller but enormously important projects over the years. This must no longer happen to us if we are serious about modernising the Bundeswehr. The 2021 Bundestag elections are crucial, because there is not much time left until then for parliamentary approval of important major projects. Two strategi-

cally very important projects are driving me forward: These are the PEGASUS and the successor to the fleet service boats. I would like to sign both before the federal elections. We want and have to provide the Federal Government with a much better picture of the situation if we in Europe are serious about strategic self-sufficiency. And for this we must also have the necessary resources for intelligence and reconnaissance.

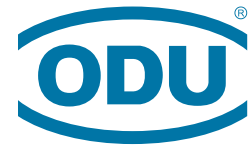
To maintain the capability of the EUROFIGHTER fleet, we also want to commission the replacement of the so-called Tranche 1 – known as QUADRIGA – as soon as possible. And then there is the EURODRONE and the cooperation with Norway on the U 212CD submarine, and last but not least the question of the second lot for the PUMA infantry fighting vehicle.

**ESD:** Will there be a second batch of PUMAs?

**Stawitzki:** Three factors are crucial for us, also in order to get political and parliamentary support for such a project. One is that the Chief of Staff of the Army can now successfully certify the operational test of the armoured infantry system, i.e. the interaction between the dismounted armoured infantry and the PUMA infantry fighting vehicle. It is the interaction between the mounted and dismounted soldiers of the infantry fighting unit and the combat vehicle that makes up the armoured infantryman. This must function reliably and be approved in the operational test. The second is the target agreement that we have concluded with the industry to significantly increase the material operational readiness of the entire PUMA fleet through the measures identified and defined there. And the third thing I would also like to mention is that we have reached an agreement with the industry on rights to the PUMA, because the minister's strategic decision not to sell the Army's maintenance logistics facilities means that we have an interest in carrying out more maintenance work on the PUMA in the long term as the predecessor, the MARDER infantry fighting vehicle, is phased out.

**ESD:** Is there still a need for reform of procurement and operational use procedures?

**Stawitzki:** We are in fact in the middle of reform. Based on the coalition agreement, the so-called Procurement Organisation Task Force was set up in 2018. This is an internal working group, but it was also supported by a group of experts,



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Photo: Damen



**One of the Bundeswehr's major procurement projects already approved by Parliament is the Multi-Role Combat Ship 180 – now re-designated class 126 frigate.**

which included representatives from science and participation bodies as well as security and defence policy makers. In the final report with its supplementary statements many individual measures – 58 in number – were proposed. As a result, the proposal follows the approach of not trying to improve procurement in a completely new approach with a single big shot. Thousands of employees are currently working on more than 10,000 contracts each year to ensure the current operation of the Bundeswehr and ongoing modernisation. This ranges from operating supplies and catering to clothing and the major projects already mentioned.

Where is the focus of our efforts? In many places we lack project management skills. This simply means that we need more employees, more staff, if we want to keep up the pace. It is foreseeable that more and more projects will be added if we want to reduce the modernisation backlog. In no empty office will a performance specifica-

tion be formulated at the end in order to open a tendering procedure and negotiate and conclude a contract with industry. For this I simply need employees. That is one point.

The other is that the processes as a whole are put to the test. We will certainly have to find more pragmatic ways forward at one point or another. That is another point.

**ESD:** You referred to the Project Management Organization at the Federal Office of Bundeswehr Equipment, Information Technology and In-Service Support (German abbreviation: BAAlNBw). Does it still make sense?

**Stawitzki:** It is also under scrutiny. It is always a question of centralisation and decentralisation. The Project Management Organization was set up to drive forward three major "lighthouse projects" of the so-called Armament Agenda: the EURO-DRONE, the Tactical Air Defence System and the Multi-Role Combat Ship 180.

With the appropriate use of resources, we have just successfully pushed the latter through the Bundestag and with the conclusion of the contract over the first major hurdle.

**ESD:** Do you want an organisation for this or can it be done by the departments?

**Stawitzki:** At the Ministry, the so-called technical supervision of selected armaments projects was established directly under the former State Secretary Suder. In the context of the current reorganisation of the Ministry for internal optimisation, I discussed with State Secretary Zimmer the idea of gradually bringing this technical supervision back into line. We always do this when we reach the essential milestone of concluding the contract so as not to change horses in the middle of the race. How the President intends to organise herself in future in the BAAlNBw is part of the current reform and has not yet been decided – since last year the Presidents of all three major subordinate offices have been given organisational sovereignty.

**ESD:** Where do you see particular challenges in international cooperation – in bilateral or multilateral armament projects?

**Stawitzki:** There is currently Franco-German cooperation in classic armament projects, specifically in the establishment of a joint air transport unit in Evreux with C-130 J purchased in the USA. As far as strategic considerations are concerned – because we are thinking far into the future – there are the development projects Future Combat Air System (FCAS) and Main Ground Combat System (MGCS), which we want to open up to Europe as soon as possible. Spain is already on board FCAS. Together with our Norwegian partners, we are also securing our common interests in terms of armament in the direction of NATO's



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Photo: Bundeswehr

***The Minister has decided not to sell the army maintenance logistics facilities, because we are interested in carrying out more maintenance work on the PUMA.***

northern flank with the portfolio of the class 212CD submarine and the Naval Strike Missile in a further developed version. Together with our Dutch partners, we are working on the digitisation of the battlefield in the context of D-LBO and FOXTROT. And with the multinational

project for new All Terrain Vehicle (ATV) under the leadership of Sweden, we are just as promising with four nations at the start.

In doing so and above all, we are trying to take into account the experience gained from the highly complex, multina-

tional weapon system projects of the end of the Cold War, which are often cited and scolded, and not to repeat mistakes. With the A400M, NH90, TIGER and EUROFIGHTER, multinational procurement programmes for highly complex weapon systems were launched at that time, which to this day are primarily subject to the dictates of political guidelines, cost-workshare issues, lack of discipline to define and then maintain common requirements and thus uniform (as far as possible identical) equipment – and all this in the face of shrinking budgets, reduced unit numbers and the dismantling or conversion of the defence industry, which today has its main pillars in the civil-commercial market.

In the end, however, one simple insight also applies to defence cooperation: as a rule, only simple things are successful. And the successful cooperation of many requires a great deal of (self-)discipline – at all levels – from politics to the individual experts in the project.

**ESD:** Thank you!

**The interview was conducted by Rolf Clement**

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# Opportunities and Challenges for the German Security and Defence Industry in 2020

**Dr Hans Christoph Atzpodien / Adrian Schwantes**

The industry's principal mission is to supply those forces and agencies responsible for the internal and external security of Germany and its citizens. Equipment provided by the industry to those clients includes all kinds of high-level armament technologies in terms of 'hardware' as well as digital products and any combination thereof. The industry is convinced that only equipment which combines the highest level of platform performance with the maximum degree of digitalisation ("digital convergence") will fully enable the police service and armed forces to perform their respective tasks properly and thoroughly.

Photos/Graphic: BDSV



**Dr Hans Christoph Atzpodien,**  
*Managing Director BDSV*



**Adrian Schwantes,**  
*Consultant BDSV*

## Industry Profile

Germany's security and defence industry is also involved in arms exports, which remain very unpopular in the public opinion despite Germany's highly restrictive export regulations and practices. Exports to non-EU or non-NATO countries are only permitted in special cases, in which Germany's Federal Government identifies a governmental security or defence interest as the basis for the approval of such an export.

The industry's economic footprint in Germany is limited, as it comprises only 120,000 directly employed and roughly 400,000 indirectly employed people with an estimated annual turnover of some €12Bn. The industry includes world-renowned defence system manufacturers such as Airbus Defence & Space, Rheinmetall, Krauss-Maffei Wegmann, thyssenkrupp Marine Systems, Lürssen Shipyards, in addition to major German defence electronics specialists such as Rohde & Schwarz, Diehl Defence, Hensoldt, Atlas



Electronics or secunet, as well as many highly specialised SMEs which represent about 80% of the nearly 200 companies organised in the Federation (BDSV). Starting in 2015, Germany's Federal Government decided that a limited number of defence technologies, in which German companies have particular expertise, are to be regarded as 'sovereign technologies'. The respective list was updated in February 2020 to the effect that a widened field of defence technology areas can now be considered 'sovereign technologies'. This includes tank technologies, naval shipbuilding technologies (both submarine and surface) and certain areas of defence electronics (e.g. crypto, electronic warfare, defence-related artificial intelligence, etc.). Being classified as a 'sovereign technology' in security and defence means that: (a) such technologies will be supported by the Federal Government in terms of procurement, R&D and under certain conditions

also exports; and (b) that procurement of equipment involving 'sovereign technologies' will serve as a trigger for invoking Article 346 of the TFEU, permitting a national procurement process instead of a Europe-wide tendering.

## Outlook Regarding Defence Equipment Purchases in Germany

The German defence budget – as currently envisaged – will amount to around €45Bn in each of the upcoming years. This assumes that COVID-19 does not require even higher financial contributions by the German taxpayers. Depending on the COVID-19 impact on Germany's GDP, a budget of €45Bn will represent between 1.3 and 1.5% of the German GDP, meaning that the 2% promise to NATO by 2024 will not be kept. Instead, the actual equipment titles of the annual budgets will remain at a level of roughly €8Bn over the coming years, equivalent to approximately 17% of the overall defence budget. This contradicts the equipment needs identified by the Bundeswehr's planning staff itself, which are shaped by the Bundeswehr's ever increasing range

**Authors**

**Dr Hans Christoph Atzpodien,**  
**Adrian Schwantes**  
Federation of German Security and Defence Industries (BDSV)



of tasks, including ongoing worldwide missions, as well as growing responsibilities inside NATO and the VJTF (NATO's Very High Readiness Joint Task Force). By comparison, France, one of Germany's closest partners, will invest an estimated €22.3Bn in defence equipment in 2021. As the Bundestag's Budget ("Ways and Means")-Committee has to approve any procurement with a project value above €25M, there is currently an urgent need to approve as many projects as possible, because Germany faces a federal general election in autumn 2021 which will cause a natural break in such approval processes. However, these kinds of approvals require very comprehensive documentation, which can occasionally be delayed because of certain bottlenecks in the MoD's armaments procurement branch. Therefore, it seems quite unlikely that all major procurement projects which the Bundeswehr would like to see materialise over the coming years will advance as quickly as required from an operational point of view.

From an industrial perspective, this limits the industry's ability to reliably plan for future demands by the German armed forces and to direct industrial resources accordingly. As reliable planning is par-



Photo: CCO GmbH

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amount for a sound basis of profitable industrial performance, any lack thereof constitutes a significant issue that may result in a shift of industrial resources to other clients and even countries. In the end, this may even contradict the government's strategy to secure the national availability of certain 'sovereign technologies' in the defence sector.

### Relevance of European Armaments Cooperation

The aforementioned aspects are of course also linked to the prospects of European armaments cooperation. Since 2016, the idea that Europe-wide cooperation in armaments development, as well as joint procurement across EU

## The German Navy's Capability Spectrum Requires Realistic Test, Validation and Training Units

**Dr. Marcello Mariucci**

Against the background of increasing digitisation and new requirements for interoperability, the German Navy has to establish a dominance in the electromagnetic spectrum. In order to master this complex task, testing and validation are crucial.

For more than 40 years, Elettronica GmbH (ELT) in Meckenheim, Germany has provided test, validation and training units based on modular and scaleable architectures which enable the user to cope with the multidimensionality of the inte-

grated sensor systems used now and in the future in the maritime environment. These are solutions designed to measure performance, test functionality and verify new algorithms and procedures. They can be used both by the manufacturer during development in the laboratory and by the user before operational use or after repair, and can be installed in the field.

The solutions provided by ELT include test and evaluation units (T&E) for radar, communication and EW systems as well as training units (TISS) for instruction and advanced training of specialists in telecommunications and electronic reconnaissance.

T&E solutions are typically used in the open field and in compliance with the legal regulations of the German Federal

Network Agency to verify and validate the functionality of the sensors under test, for example during acceptance or after repair. TISS solutions, on the other hand, are used in computer classrooms for training operators and their interaction, for example in Brigade command posts. What both solutions have in common is that they emulate the electromagnetic spectrum to simulate threats in order to evaluate the effectiveness of the units being tested.

The experience gained over four decades with ELT Group's own tactical, operational and strategic systems in Meckenheim has resulted in a wide range of tools and systems for signal and data processing as well as for the system-supported preparation and implementation of test campaigns for maritime users.

### Author

**Dr. Marcello Mariucci** is Managing Director of Elettronica GmbH.



Member States, will save money for all participants and strengthen Europe's defence industrial base. has been revitalised. Therefore, PESCO (Permanent Structured Cooperation), an instrument already foreseen in the Lisbon Treaty of 2007 for increased defence cooperation

stage of conceptualisation. Thereafter, the MoD must immediately signal clear and reliable support to the industry, as no company may successfully participate in negotiations for cooperation partnerships without its government's backing. In this latter step, both sides still have to

ject strategy or work programme, which must be both functional in terms of its output as well as profitable for all participating partners. Most importantly, this necessitates the absence of any political influence, including governmental compensation requests (upheld by certain EU Member States under the auspices of Article 346 TFEU) or the requirement that certain national industrial resources are involved irrespective of economic or technological context. In practical terms, this means that a solid cooperation requires the lead by a single, strong system integrator that involves smaller SME-specialists, altogether forming a reliable value-chain in order to provide the clients with a technologically and commercially sound product.

Finally, it has to be mentioned that those Member States involved as clients in a supranational armament procurement procedure must make deliberate efforts to eliminate further barriers and obstacles which tend to negatively impact the success potential of European cooperation. This addresses a variety of incompatible national construction and acceptance requirements, as well as differing export control practices, both in terms of the general strategic approach to exports and different practices with respect to individual countries.

Most EU Member States consider Germany the most restrictive and even an unreliable partner sometimes in terms of export controls. This is another major reason why potential partner countries which rely more heavily on exports, are hesitant to enter into a procurement partnership with Germany and its industry. 'German-free', as such excluding arrangements have been labelled by some, should not replace the familiar and positively understood label 'Made in Germany'.

If the above-mentioned obstacles are dealt with properly, such cooperation will contribute to the often-quoted European 'Level Playing Field' in the best possible manner.

### German Security and Defence Industry Aiming to be a "Good Citizen"

In Germany, many people still tend to think that external aggression does not really constitute an imminent danger. This perception derives from the immediate aftermath of the German re-unification thirty years ago, as well as the peaceful phase Germany and its citizens have experienced ever since. It is there-



Photo: CCO GmbH

### High-ranking national and international delegates at the German Meeting Point at EUROSATORY 2016

among participating EU Member States, has been filled with projects. Moreover, two additional programmes, the EDIDP (European Defence Industrial Development Programme) and the EDF (European Defence Fund), have been launched, or will be launched shortly, offering EU-funding for defence projects for the first time, insofar as participating companies agree to cooperate under a 3+3 scheme (meaning three different companies from three different EU Member States).

While the German MoD – in contrast to many of its European partners – has used PESCO primarily in areas of operational cooperation but not for armaments cooperation or procurement, the EDIDP and the future EDF will be used in order to foster industrial cooperation across the EU, in which German companies are expected to participate. Such cooperation can either follow a 'top-down' approach, as for example the ongoing German-French or German-Dutch defence projects, or a 'bottom-up' strategy driven by the industry's own initiatives. In this latter case, however, it is of paramount importance that such initiatives are harmonised with the MoD's capability planning processes for the Bundeswehr, as well as existing R&D or procurement projects at an early

improve their coordination and put those improvements into practice.

Overall, if European industrial cooperation for armaments is aimed to be more successful than it has been in the past, the conceptual drive should not be left to European institutions such as EDA (European Defence Agency) or the Commission. The requirements for defence equipment set by EU Member States for their respective armed forces will naturally always be linked to aspects of national sovereignty, although aspects of industrial self-sufficiency will also influence such considerations. This means that the Member States have to lead the process of defining areas of military and equipment procurement cooperation, thereby paving the way for industrial cooperation which will aim to follow government decisions.

For the industry, the economic circumstances of any cooperation are of vital importance and ultimately determine its success. This is especially true for German defence companies which are not state-owned, but either under private ownership or publicly listed with resulting management responsibility vis-à-vis a largenumber of sometimes international shareholders. Consequently, cooperation agreements must establish a sound pro-



fore important that the incumbent, as well as any future Federal Governments, take adequate efforts in confronting the public with the reality of hybrid risks to which Europe as a whole, and Germany in the midst of Europe are exposed. Only such continuous wake-up calls can positively influence public opinion regarding the armed forces and their needs in terms of manpower and equipment, as well as the public spending required.

A second element of this public discussion which needs to be watched and developed carefully, relates to the "green deal" and its wider impact. Notwithstanding the fact that sustainability is key for current and future generations on both a global and regional scale, we have to ensure that Europe's common security and its sustainability are not seen as contradictory to each other. In fact, the relation is the opposite: security is key for all aspects of sustainability!

Nevertheless there is a strong and rather unreflected tendency in Germany to exclude efforts in favour of the armed forces, armaments or defence technologies not only from the research agenda of most German universities, but also from the list of assets which financial institutions and regulators should support in the drive towards sustainable finance.

For example: the recently emitted first tranche of green government bonds (Green 10-year Bond) expressly states in its official framework, that money derived from any such green bonds will

not be used for purposes of 'armaments, defence, tobacco, alcohol and gambling'. This entirely odd composition of exclusions represents a typical German habit of taking security against the external threat for granted.

At the same time, however, such a mixture of feelings vis-à-vis defence and sustainability endangers the economic basis of Germany's security and defence industry, as it will eventually become more difficult and expensive for companies to obtain lines of credit, insurance policies and other financial instruments at market-oriented conditions or even at all.

Recent examples have already shown a tendency of major German banks and insurance companies to simply exclude defence-related activities from their business or portfolio, as this makes life easier for them with respect to sustainability reports etc.

Our industry hopes for leadership by the German Government, but also by the European Commission, in order to provide appropriate guidance to private financial institutions with respect to security and defence and their relation to sustainability.

### Summary

Today, the German security and defence industry can still regard itself as one of the most technologically advanced defence industries of the world. This is proven by a sound global demand, regardless of the

fact that parts of this demand cannot be met due to the country's prevailing armament exports policy, which the industry has and will continue to accept.

The leading role of the German security and defence industry is primarily rooted in the skills of its employed workforce, in its strong references in the past, but also in the relationship with the Bundeswehr as its reference customer utilising newly developed products in the field. Therefore, the industry is committed first and foremost to maintaining this partnership with its prime customers, the Bundeswehr and Germany's police services. However, this kind of relationship necessitates mutual commitment and support. That is why our Federation and the German MoD have jointly invested considerable time and effort into a so-called Strategic Dialogue between MoD officials and industry representatives launched in 2014 and which pursues a declared benefit for both sides.

Defence business is and will remain government-driven business. This is the reason why the security and defence industry in Germany, notwithstanding the fact that it is privately owned, needs continuous support by the German Government in order to maintain its technological edge and industrial capabilities in the future. This reflects the sovereign aspects of the defence industry, but also its 'system relevance' and its fundamental contribution to a continuous and forward-looking sustainability of our society. ■



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# Bundeswehr Cyber Innovation Hub

Sven Weizenegger and Dr. Stephanie Khadjavi

Getting innovations into the hands of soldiers faster: The Cyber Innovation Hub of the German Armed Forces (CIHBw) is the first military Digital Innovation Unit (DIU) in Germany to take on this task.

As a DIU, the CIHBw is able to bring together partners who would otherwise have little chance of exchanging information, namely, the German Armed Forces and the industrial start-up scene. Both can learn a lot from each other, cultural aspects included.

The CIHBw was founded in early 2017 (as the first DIU of a German ministry ever), initially as a three-year project by the Federal Ministry of Defence (FMoD). After a successful pilot phase, the hub was consolidated at the beginning of this year and has since been anchored as an innovation unit in the BWI GmbH, the Bundeswehr's IT system house. As a DIU, the CIHBw acts at the interface between the start-up ecosystem and the Bundeswehr, and is intended to help drive forward the digital transformation of the armed forces. Its vision "Empowering Innovation in Defence" is geared to the needs of the soldiers and civilian employees under the aegis of the Federal Ministry of Defence (BMVg).

Pictures: CIHBw



## Digital Innovation Units as Catalysts for Progress

The idea of establishing separate DIUs for the digital transformation of large organisations such as corporations, or even public service institutions is not new. It is based on the ideas of Clayton M. Christensen, a management professor at the Harvard Business School, whose 1997 bestseller "The Innovator's Dilemma" has since become firmly established in science and practice. In general, DIUs refer to institutionalised innovation units of large organisations. Their specific characteristics include innovation hubs, innovation labs, incubators, accelerators, company builders or corporate venture capital. Despite all the

**Agile, collaborative working is considered to be a key for innovative strength and convincing performance.**

conceptual differences, the vision is always the same: as with small, flexible dinghies, DIUs are used to drive innovation for the comparatively inflexible tanker, the core organisation. DIUs such as the CIHBw not only rely on cooperation with start-ups, but also use start-up methods that have proven themselves in internal work organisation and culture, and bring creative and innovation-savvy talents into their team. DIUs test new ideas at high speed, discarding the bad ones and developing the good ones further. This results in the challenge to transfer the tried and tested innovations back to the "mother ship", in this case the Bundeswehr.

bers and budget. The majority of these units have only been launched in the recent past; the approaches taken vary widely and cover the entire spectrum of the innovation cycle. One of the comparatively newer US innovation units is the Defense Innovation Unit (2015), which specialises in testing dual-use products from companies and start-ups for military applications. The Defense Innovation Unit comes closest to the CIHBw's remit and served as a reference point when it was established.

## Author

**Sven Weizenegger** is the Head of the Bundeswehr Cyber Innovation Hub (CIHBw);

**Dr. Stephanie Khadjavi** is the CIHBw's contact person for start-ups and companies.

## The US as a Role Model

In the military sector, the US clearly dominates in this field: it is a leader in military innovation units both in terms of num-

## The Team as a Success Factor

A key factor in the success of the CIHBw is the high diversity of its current team of around 40 staff, which includes both military and civilian members; as such, it is unique in Germany. The majority of the



**The Cyber Mission - Right of Command app provides realistic everyday life scenarios.**

soldiers are reservists, and many of the civilian employees have start-up experience. It has been possible to attract entrepreneurs from the start-up ecosystem and the digital economy, and to build up a network of members of the reserve in the sense of a reinforcing element to support the digital transformation.

### User-Centred Approach

The starting point for the CIHBw's innovation projects is always a concrete requirement of the user within the Bundeswehr or the FMoD. The aim is to support and simplify their work with innovative ideas and solutions, preferably from the start-up world.

Various measures provide support for the fulfilment of the assignment. These include:

- The CIHBw identifies so-called "dual use" products, i.e. products with possible applications not only in the civilian sector, and validates their added value directly together with users in the Bundeswehr. If the expected added value is clearly confirmed, a recommendation for introduction on a broader basis follows.
- The CIHBw maintains a programme that is intended to enable soldiers and civilian employees to act like founders and to advance their own innovative ideas for the accomplishment of their missions. As a result, this not only promotes new ideas "for the troops by the troops", but also fosters the general cultural change towards more innovative and entrepreneurial thinking.
- The CIHBw creates an infrastructure for networking, know-how trans-

fer and cooperation between the Bundeswehr and the relevant actors from the start-up ecosystem, administration and technology. In this way, the CIHBw also supports the public perception of the Bundeswehr as a competent partner for innovation and digitalisation.

### Agile, Collaborative Working

The CIHBw sees a particular focus on its role model function in terms of personal responsibility and self-organisation as the key to innovative strength and hyper-performance. The driving force behind this is the adaptation to innovation and the overcoming of obstacles to innovation. This involves systematic value creation, which creates a collaborative innovation culture through the professional use of agile working methods such as Scrum, UX-Design or Design Thinking. The operationalisation of the CIHBw mission is based on Objectives and Key Results (OKR), a management system for goal-oriented and modern employee management. In close coordination with the CIHBw management, employees organise themselves in interdisciplinary teams to achieve their goals. Inefficient silo structures have no chance in this way!

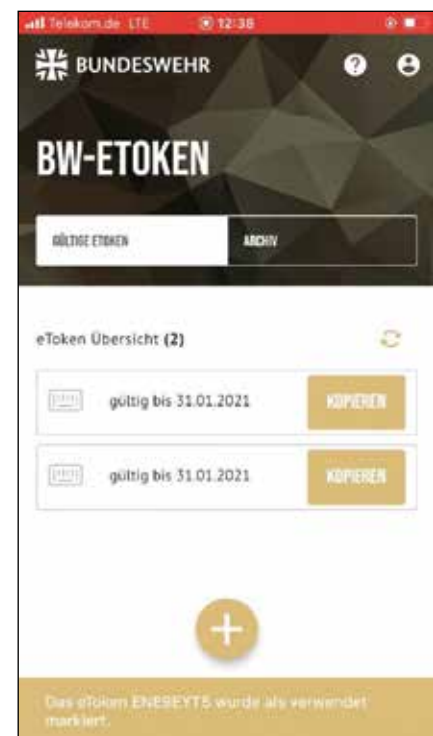
### Broad Range of Topics

The projects of the CIHBw are very heterogeneous. The so-called "use case", i.e. the application case for an innovation, can basically come from all organisational areas of the Bundeswehr and the FMoD business area. Apart from intellectually

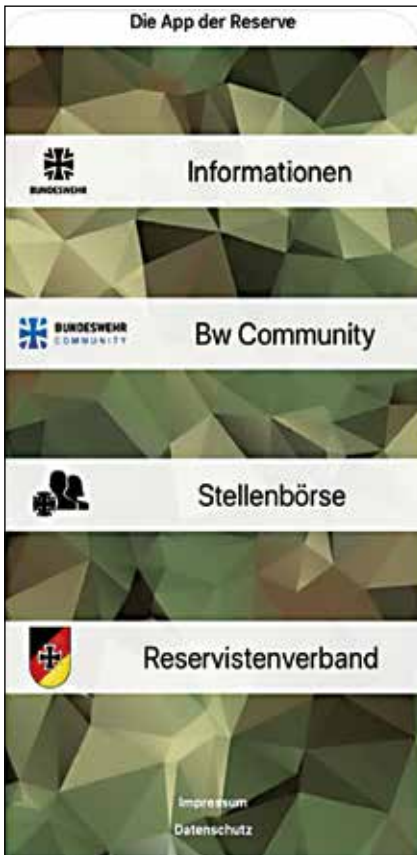
obvious topics such as equipment and qualification of the soldiers of the various branches of the armed forces, one has to consider that the Bundeswehr is also one of the largest employers in Germany and at the same time represents an international logistics company, IT service provider, hospital operator and education provider. The starting points for the digital transformation are correspondingly diverse. For a start-up to cooperate with the CIHBw, the solution must be digitally driven or at least contain a digital component. Together with users from the Bundeswehr, the CIHBw is currently testing various solutions to make the Bundeswehr more mobile, secure and digital. The range of innovation projects is wide and is partly subject to secrecy requirements.

### Bring Your Own Device

The coronavirus pandemic has particularly underlined the added value of digital solutions that are directly geared to the everyday life of soldiers. It has been shown that the "Bring Your Own Device" (BYOD) approach is playing an increasingly important role if you really want to reach the broad masses. The provision of official applications for private end devices represents an efficient and service-oriented way of providing soldiers with dedicated information and functions even without smartphones or tablets provided by the employer.



**User interface Bw-eToken app.**



The functionalities of the app of the reservists include, among others, on the job market ("Stellenbörse").

### BwChat

A very good example of the usefulness of the BYOD approach is the BwChat messenger system, which the CIHBw has been testing since 2018. As a secure and approved means of communication and collaboration on private end devices for business purposes, the messenger has all the usual functionalities of modern communication tools. Especially since the coronavirus crisis, the Bundeswehr has become increasingly aware of the importance of providing a secure, fast and direct means of communication for the troops.

### App of the Reservists

The most recent example is the reservist app developed by the CIHBw. It makes it easier for members of the reserve, active soldiers and interested parties to access information about the reserve and to exchange information with each other in the BwCommunity area. In addition, the app offers a job exchange with an overview of the open posts in the reserve. This should make it easier and faster for qualified personnel to fill vacancies.



Using the Bw-eToken app, soldiers can obtain and use the digital access codes required to book rail travel in uniform on private devices.

### Cyber Mission - Right of Command

With this app, the CIHBw offers a playful accompaniment to the legal instruction of soldiers. Does an order have to be complied with? These and other questions are dealt with in realistically illustrated scenarios from the exercises and everyday life of the Bundeswehr. In a motivating way, the app thus helps to provide soldiers with confidence in their daily work and actions.

### Bw-eToken App

The Bw-eToken App, which CIHBw launched in May this year with partners

from the FMoD, the Bundeswehr and BWI, also shows how user centricity creates concrete added value. As part of the free uniformed rail travel, Bundeswehr soldiers can now obtain and use the digital access codes, so-called eTokens, required to book rail travel in uniform on private devices - until now, the booking codes were only available via the Bundeswehr's Intranet. The app makes it easier for soldiers to be more mobile in everyday life and supports the political goal of further strengthening their visibility as citizens in uniform in public life.

All the above-mentioned apps are freely available in the AppStore (iPhone) and on Google Play (Android).



"Problemlösung" - Problem solving is among the CIHBw's core objectives.



## Usage of Mobile Devices in Bundeswehr Hospitals

Corona-related mobility and communication restrictions have also impaired the sphere of action of Bundeswehr medical personnel. In order to relieve both doctors and patients, the CIHBw is currently testing two innovation projects together with the Bundeswehr Berlin Hospital: a video-supported online consultation for interaction between the doctor and his patients, and the care app. With the care app, patients can signal their needs on the mobile device, such as assistance when going to the bathroom, topping up their drinks or taking painkillers. This request is then sent to the smartphone of the nursing staff via a secure connection. Unnecessary visits to the patient to clarify needs are therefore avoided, and the patient receives immediate feedback and status messages via the app. Both approaches, online consultation and care app, help to reduce personal contact and make more efficient use of service resources.

## Awakening the Founding Spirit in the Bundeswehr

As already mentioned, another focus of the CIHBw is to establish a start-up culture in the Bundeswehr. To this end, the CIHBw pursues the goal of enabling soldiers and civilian employees from the FMod's business area to become defence entrepreneurs and supporting them in the further development of their ideas. In order to enable them to act "like an entrepreneur in a company", the CIHBw provides the necessary training in agile methods, cooperation with start-ups or the provision of the necessary hardware and software. The release of time resources is also undertaken in close consultation with the responsible superiors. In this way, the CIHBw not only contributes to problem solving "for the troops by the troops", but also to a cultural change in the Bundeswehr towards

more willingness to innovate and entrepreneurial thinking. Currently, five entrepreneurs are being programmatically supported by the CIHBw. These include one member of the Bundeswehr Command and Staff College, whose aim is to build the best cyber resilience app game in the world - for business and private mobile phones.

## Experimental Development

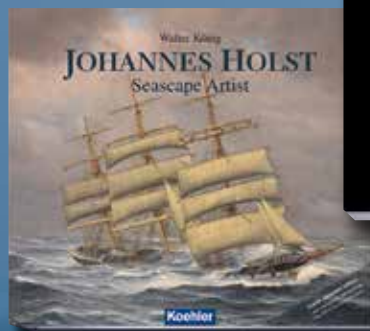
In the "Y.Lab", a new promising pillar of the CIHBw, future prototype solu-

tions will be developed jointly with the Bundeswehr, either as an in-house initiative, in cooperation with the BWI or with external partners, and depending on the topic. The focus is on software development for the core mission of the armed forces in a state-of-the-art development environment (DevSecOps). In an exemplary way, the Y.Lab combines the basic idea of DIUs, namely to combine the best of two worlds: agile working like a start-up and the possibility of using the resources and know-how of the core organisation, in this case the BWI. ■

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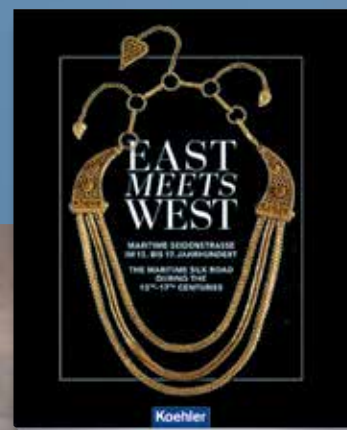


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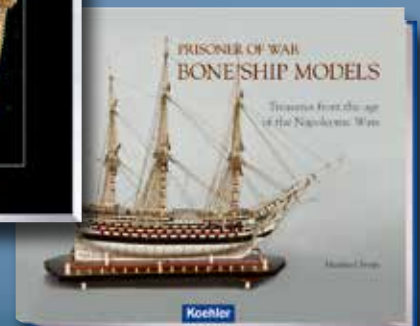


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# Egypt: A Regional Naval Power?

Conrad Waters

Egypt's control of the Suez Canal and, consequently, over one of the key maritime trade routes between Europe and the East has long provided it with both the rationale and potential to become an important regional naval power. This prospect has come closer to realisation during the course of the current Sisi presidency.

A significant programme of naval investment has coincided with the emergence of new maritime challenges to increase the importance and profile of the Egyptian fleet. Whilst much progress has been made in a short period of time, questions remain as to the revamped navy's true effectiveness.

Photos: via author



## Background

The opening of the Suez Canal in November 1869 placed Egypt firmly astride one of the world's most important sea lanes of communication. The country's strategic maritime importance was reflected in the development of Alexandria as a significant British Royal Navy base during the quasi-colonial era. However, the emergence of neighbouring Israel as Egypt's main regional opponent after the Second World War meant that the navy inevitably took a low priority behind the army and air force once Egypt achieved full independence. The experience of the Suez invasion in 1956 and the ready availability of supplies of Soviet equipment facilitated the creation of a reasonably effective littoral fleet. This achieved momentary global fame when the Israeli destroyer ELIAT was sunk off Port Said by Egyptian missile craft in October 1967.

The development of effective Israeli countermeasures – including the introduction of new equipment and tactics – meant that the ELIAT attack was very much the high water mark of Egyptian naval operations during the era of Arab-Israeli conflict. The navy's role changed little following the country's re-alignment away from the Soviet Union into the American sphere of influence in the mid-1970s and the Egyptian-Israel Peace Treaty of 1979. US military aid assisted a hesitant and somewhat limited process of fleet renewal over subsequent decades.

## Author

Conrad Waters is the Editor-in-Chief of our sister magazine Maritime Security & Defence.

**The sale of the two amphibious assault ships to Russia was cancelled following Russian military actions in Crimea and Ukraine. The Egyptian Navy became the second African fleet to operate such vessels, Algeria having commissioned the smaller amphibious transport dock KALAAAT BÉNI ABBÈS the previous year.**

However, the focus remained very much on maintaining the security of Egypt's coastline, the Suez Canal and its immediate approaches. Essentially, the navy continued to be seen as a means of local defence rather than as a tool for exerting wider influence.

## New Priorities

The long-established status quo has swiftly unravelled with the emergence of Abdel Fattah el-Sisi as Egypt's leader in the aftermath of the military coup that removed the previous president, Mohammed Morsi, in 2013. Although an army general without a maritime background, Sisi is credited with driving a new focus on naval power as part of a strategy aimed at increasing Egypt's regional authority. Notably, this includes development of expeditionary naval capabilities. This revised approach has coincided with an evolving geo-political backdrop that has made the ability to deploy maritime power rather more important than it was previously to Egypt's overall security.

The relative importance of the various reasons associated with the higher priority given to the navy in current Egyptian defence strategy has been much debated. It is apparent that a desire to bolster Egypt's standing with friendly Arab countries has been a key plank of the Sisi regime's foreign policy. This objective has been coupled with the recognition that naval power is a relative weakness in the military toolkit of many of these regional allies, presenting a gap that Egypt is able to fill. Egypt has been the beneficiary of substantial financial support from Saudi Arabia and other members of the Gulf Cooperation Council, leading to suggestions that some of this largesse has been directed towards expanding the Egyptian fleet into something of a proxy navy for regional allies with more limited naval capabilities. Whilst these claims may be somewhat overblown, it seems likely that many friendly countries value increased Egyptian naval capacity as a balance to ongoing Iranian assertiveness across the region. From an Egyptian perspective, Iranian involvement in Yemen's ongoing civil war





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has reinforced the appreciation that the maritime security needs of the Suez Canal's southern approaches extend far beyond territorial waters. The ability to exert naval power along the Red Sea trade route and into the Gulf of Aden has now become much more of a priority. This is reflected in the inauguration of a new Southern Fleet command at Safaga in January 2017 and the considerable efforts being made to develop infrastructure along the Red Sea shoreline. The most recent development in this regard was the opening of a massive new 150,000 acre military complex at Berenice in early 2020. Equipped with 1,000 metres of berthing facilities and a large airfield, the base is clear evidence of Egypt's intention to play an expanded maritime security role across the Red Sea region.

The expansion of Red Sea infrastructure has gone some way to rebalance the Egyptian Navy away from its previous focus on the historic fleet base of Alexandria. However, it is the Mediterranean where Egypt currently faces some of its greatest maritime security challenges. Here, conflicting claims over natural resources have combined with Turkey's drive to increase its own influence across the Middle East to ramp up tensions that had already been inflamed by the Turkish Erdoğan's presidency's past support for the ousted Morsi regime. Turkey's active involvement in Libya's civil war in support of the United Nations-recognised Government of National Accord (GNA) has been yet another point of contention. The fact that Turkey has proved willing to deploy its own navy – arguably the most powerful in the region – across the Eastern Mediterranean



***For example, it has been claimed that a deterioration in the previously close relations between Sisi and the French Macron presidency influenced the decision not to exercise options for further GOWIND type vessels.***

in support of its various interests has been another spur for Egypt to expand its naval capabilities.

### **A Programme of Investment**

The Egyptian fleet of a decade ago reflected the modest expectations held for it at that time. Its most significant assets were a quartet of Project 033 ROMEO submarines of

Chinese origin that had been modernised with US assistance. The US Navy was the source of the main seagoing surface fleet of four second-hand FFG-7 type frigates and two of the older KNOX class. These were supplemented by two pairs of DESCUBERTA and JIANGHU I light frigates constructed, respectively, in Spain and China. The bulk of the fleet's remaining frontline combatants comprised around 30 missile attack craft of varying capabilities, with limited numbers of relatively capable European vessels being supplemented by more numerous Russian designs that had benefitted from varying degrees of modernisation. All of these ships had experienced at least a quarter of a century of service; often considerably more.

The Egyptian Navy's limited ambitions were also illustrated by the main procurement programmes then underway. Prominent amongst these was the acquisition of four AMBASSADOR III fast attack craft under a contract awarded to VT Halter Marine in 2005. Financed with the help of US military aid, the US\$1.3Bn programme was specifically aimed at equipping the navy with modern vessels that could provide defensive protection for the Suez Canal's approaches. Also on order were two Type 209/1400(mod) submarines under a contract signed with Germany's TKMS in 2011.

The advent of the Sisi regime quickly gave rise to a step change in both the nature and quantity of naval procurement. This first became evident in mid-2014 when it emerged



***Naval Group celebrated the launch of the first Egyptian GOWIND corvette EL FATEH at the Lorient naval shipyard in September 2016. EL FATEH successfully concluded its first sea trials by the end of March 2017. The Egyptian Navy took delivery of the vessel in September 2017, three years after the order was placed.***



**The French-designed MISTRAL class helicopter carrier GAMAL ABDEL NASSER was originally built for the Russian Navy but the contract was cancelled by France. Egypt and France concluded the deal to acquire the two former Russian MISTRAL for roughly €950M. Egypt is the first and to date only country in Africa and the Middle East to possess a helicopter carrier.**

that the then DCNS (now Naval Group) had been awarded an estimated €1Bn contract to supply four GOWIND type corvettes to the Egyptian Navy. The contract provided for the assembly of three of the new ships in Alexandria in another indication of Egypt's growing aspirations. The GOWIND deal was quickly followed in February 2015 by the 'off the shelf' purchase of the larger and more complex FREMM frigate NORMANDIE, which was already well through her trials programme under the control of a French Navy crew. At the time, it was reported that the urgency behind the transaction was the Egyptian president's desire to have a major new unit present at the celebrations being held to promote the Suez Canal's upgrade. These initial acquisitions could be seen in the context of renewing existing capabilities. However, the Egyptian Navy's subsequent purchase later in 2015 of two MISTRAL class amphibious assault ships originally destined for the Russian Navy marked a significant expansion in fleet capacity. Commissioned in June and September 2016, the helicopter carriers provided Egypt with the potential to conduct naval expeditionary operations unmatched elsewhere on the African continent. 2015 also saw Egypt exercise options for an additional pair of Type 209/1400 submarines to complete the upgrade of its underwater arm.

After a short pause, news of further naval investment emerged in early 2019 with German press reports of a potential sale of MEKO A-200 frigates to the Egyptian fleet. Although details of the deal vary according to source, it seems the acquisition of up to six surface combatants is envisaged, of which two may be subject to options. The transaction reportedly follows an Egyptian decision not to take up the option of building further GOWIND type corvettes in Alexandria. Subsequently, in 2020, an additional international dimension to the navy's spending spree emerged with news of ongoing negotiations to acquire a pair of Italian Navy variant FREMMs from Fincantieri. They may form part of a wider armaments package believed to total over €10Bn.

It is also worth noting that Egypt's massive investment in new warships has also been supported by significant enhancements to naval infrastructure. The joint forces base at Berenice is just one of a number of new or modernised facilities intended to improve the operational effectiveness of the equipment being acquired by both the navy and other branches of the armed forces. For example, berthing at the Northern Fleet's main Alexandria base – still by far the most important Egyptian naval facility – has been expanded to accommodate the greater dimensions of the new amphibious assault

ships. Further investment had been directed towards Alexandria Shipyard to assist local GOWIND assembly.

## Challenges Ahead

Although it can be seen that the Egyptian Navy is clearly benefitting from substantial investment under the current regime, it still faces significant hurdles if it is to achieve its leaders' ambitions to become a true regional naval power. There appear to be three major areas of potential difficulty.

The first of these is funding. According to analysis by the respected Stockholm International Peace Research Institute (SIPRI), Egyptian spending on arms imports tripled between 2010–14 and 2015–19. This made it the world's third-largest arms importer during the latter period. Much of this expenditure was directed towards naval equipment. Lack of transparency and the substantial role played by the Egyptian military in running the country's wider economy makes the country's actual defence budget particularly opaque. However, it seems unlikely that Egypt's finances are strong enough to sustain this level of spending without ongoing support from its allies elsewhere in the Arab world. Given the vagaries of international relations and the increased pressure on government finances as a result of the current aftermath, continuation of this support cannot be taken for granted. Given that many naval programmes remain work in progress, it is by no means certain that Egyptian fleet modernisation will be satisfactorily concluded.

Another major challenge is sustainment. This has two aspects. One is the fact that Egypt has chosen a particularly eclectic mix of suppliers to achieve its naval modernisation. Recourse to France, Germany and now seemingly Italy for various major programmes has been supplemented by acquisitions of other equipment of American, Russian and even South Korean origin. Many procurement choices appear to have been driven more by considerations of politics rather than practicality, with Egypt prioritising security of supply from countries that chose to overlook the current regime's questionable human rights record. This will, however, create problems down the line in the form of the need to implement multiple logistic supply chains for diverse weapons and systems. It also seems likely that there will be additional complications in terms of operational compatibility and ease of training. In spite of the attention paid to improving naval infrastructure, the question of whether Egypt has the facilities to support the large amount of complex new equipment it has acquired in an effective manner must inevitably be a concern. In this regard, progress

with construction of the new GOWIND corvettes at Alexandria with Naval Group's assistance will be an important future indicator. The launch of PORT SAID, the first locally-assembled GOWIND, in April 2018 was heralded as marking an important step in bringing major warship construction to the African continent. However, the ship's most sophisticated equipment – its panoramic sensors and intelligence module (PSIM) integrated mast – is constructed and tested at Lorient in France, being shipped complete to Alexandria for final installation. Even with this assistance, fitting out is proving to be a lengthy affair and the ship had yet to be commissioned at the time of writing. Such delays in a new programme are nothing new. Moreover, it is known that the Egyptian Navy has signed a five-year agreement with Naval Group for the in-service support of all the vessels delivered by the company in recent years. Nevertheless, these arrangements will need to be robust if Egypt is to obtain full value from its new ships.

The final issue relates to training. The Egyptian Navy is regarded as being relatively well-trained by regional standards. It is also clear that efforts are being intensified to improve performance, for example by increasing training with more established fleets. However, the Egyptian Armed Forces as a whole have not earned a particularly favourable reputation for proficiency during the conduct of international operations. Moreover, some reports of recent naval exercises suggest the fleet has some way to go to achieving optimum efficiency. A much enhanced level of training will inevitably be required to operate the much more advanced ships



**The GOWIND class corvette PORT SAID ordered by Egypt is still under construction.**

now being acquired. Perhaps more significantly, the more profound changes in operational doctrine required to take full advantage of the quantum leap in potential capability inherent in these vessels will not be achieved overnight.

### Analysis

The Egyptian Navy has embarked upon a remarkable programme of rapid modernisation and expansion since the commencement of the Sisi presidency in 2013. Substantial investment has accelerated the

replacement of obsolescent warships after a period of neglect. More significantly, the acquisition of new capabilities has enabled the fleet to look beyond the needs of local coastal defence towards deployment of regional expeditionary capabilities. It is encouraging that attempts have been made to support this expansion by bolstering supporting infrastructure. The construction of new bases and embryonic attempts to establish a local naval shipbuilding capability are indicative of a longer-term commitment to establishing an effective naval force.

Real progress has therefore been achieved. However, it is still difficult to avoid the conclusion that the regime's lofty aspirations to turn the navy into an instrument of regional influence have resulted in attempts to make it run before it has learned to walk. Its new warships represent a generational change over those previously operated, whilst assets such as the MISTRAL class amphibious assault ships require the development of operating skills that have never been previously employed. The politically-driven decision to diversify suppliers across a range of friendly countries will exacerbate the challenges inherent in supporting what is essentially a new navy.

In short, the Egyptian Navy's modernisation represents a high-risk gamble to transform a coastal defence force into a regional naval power. It remains to be seen whether the outcome of this programme will achieve Egyptian expectations. However, the past history of such attempts is not encouraging. ■



**The PORT SAID's most sophisticated equipment – its panoramic sensors and intelligence module (PSIM) integrated mast – is constructed and tested at Lorient in France.**

## Top Munitions Makers Choose Poland

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A wide range of filling services is offered, using three methods: screw-threading, pressing and casting. "We fill medium and large calibre ammunition – such as artillery projectiles, tank ammunition, rocket missiles and mortar bombs. Pressing and casting methods allows us to fill the bodies of various types of sea mines, antitank mines, aerial bombs, shaped charges and boosters. We also have the possibility to fill insensitive ammunition, limiting accidental initiation," explains Andrzej Łysakowski, President, NITRO-CHEM's Management Board. NITRO-CHEM has more than 70 years of experience in the production of explosives and ammunition. It has reliable, efficient and continually modernised production facilities, which are based on the best technological solutions. The company also includes an R&D department.



Photo: NITRO-CHEM

*The NITRO-CHEM ammunition production line in Bydgoszcz, Poland*

As a result, the products and services provided are of the highest quality, corresponding to many international standards, including NATO standards. Based in Poland, NITRO-CHEM has a quality management system compliant with ISO 9001 and AQAP 2110 standards and exports to many countries, including the USA, Canada, Great Britain, France, Spain, Italy, Germany, Sweden and South Africa.

NITRO-CHEM's development reached an important milestone in 2019 with the introduction of a filling line for Mk 82 aerial bombs – included in the payload of F16 fighters, for example. This type of armament is found in the inventories of almost all armed forces belonging to NATO. NITRO-CHEM is looking at export possibilities to other, non-aligned markets as well.



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# Exercise Baccarat 2020 – Aerocombat Hits the Alps

**Pieter Bastiaans**

No longer centered around a counter-insurgency (COIN) scenario, this year’s exercise was focused on conducting high intensity operations against a (near) peer conventional enemy, with the mountainous area between Valence, Grenoble, Gap and Briançon in the southeast of France being at the disposal of participating units, both French and British.



Photos: Pieter Bastiaans

**The French Army’s 4th Army Aviation Brigade is currently commanded by Brigadier General Frédéric Gout.**

Using the French Alps as the scene, the 2020 edition of the annual airmobile exercise Baccarat saw the French army air corps’ 4e Brigade d’Aerocombat (4 BAC) preparing for major combat between 14 and 25 September. Also involving live firing exercises, Baccarat 2020 was led out of Varcès by 4 BAC’s command post and saw

## Author

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all three of the army aviation brigade’s helicopter regiments being trained. Elements of the French army’s 27th Mountain Infantry Brigade supported by reconnaissance, engineer, artillery (MLRS, UAS), and (V) SHORAD units, in the main divisional level units, bore the brunt of the exercise’s ground action. The British Army Air Corps’ 4th Regiment meanwhile dispatched two of its AgustaWestland built Apache AH1 attack helicopters which was the most it could manage due to COVID-19 restrictions. In total, Baccarat 2020 involved some 1600 troops and 35 helicopters, the latter operating out of Chambaran barracks, Valence-Chabeuil and Grenoble-Le Versoud airfields.

Speaking to ESD during the exercise, brigadier general Frédéric Gout, 4 BAC’s commander since August 2019, explained the reasons that led to the creation of the brigade in mid-2016: “In 2013, when I was commander of the 5th Combat Helicopter Regiment that spearheaded operation Serval in Mali, the brigade level was lacking. It was difficult to organise the beginning of the operation. That’s one of the arguments that led us to bring back a dedicated brigade. When we have to deploy, it is better to have a rear brigade level that enables the training, logistics etc that might be needed for such an operation”. He continued: “Now we have coherence between the brigade and its regiments, one of which is always involved in the Sahel region with other detachements also operating in Ivory Coast and Djibouti”. Asked about the shift from COIN to major combat, General Gout replied: “Due to strategic changes that are occurring right now, we have to improve our level of training. We are preparing for the next involvement, which most likely will be different, perhaps even a high intensity conflict. That’s why we have made this year’s scenario more difficult, opting for the Alps

mountains instead of the Champagne basin area between Marne and Vosges”. The latter area was used during the previous three iterations of Baccarat. He continued: “Next year, we prepare to do an amphibious variant whereas the year after might see an airborne, SOF version of Baccarat”.

## Aerocombat

“Our concept of “Aerocombat” is part of land manoeuvre and hence part of every operation”, General Gout told ESD. “We aim for total integration of our airmobile assets with our land forces. It’s an integral part of them, unlike the air assault capability fielded by some of our NATO partners which is more of a niche capability. Another difference is that in a number of countries part of the helicopters is in the air force, whereas in our system all assets needed for aerocombat are concentrated in the land forces”. Gout continued: “In order to enable airmobile, air assault and air-mechanised operations, the concept that we use allows maximum flexibility. This means the 4th Brigade is due to train with all infantry and armour battalions of the French army that are preparing for their next commitments. This is partly because there is no longer a dedicated ground element that is part of the brigade.” Instead, using a combined arms approach, 4 BAC now fields an aerocombat adaptation group in order to ensure maximum diffusion of heliborne skills across the French land forces. This unit optimises the integration of the brigade’s rotary wing units with the army’s manoeuvre regiments using a two-tier system. On the one hand, tier one units, mostly specialised airborne and mountain troop’s reconnaissance elements, are easily integrated into the “aerocombat” scheme of operations. This is due to the way they operate being used for “immediate extraction” (the French

army aviation's specific personnel recovery concept which is used to immediately pick up any downed crewmembers) for instance or for wider non-foreseeable operations. Meanwhile tier two units mostly include regular manoeuvre battalions that are typically put on alert for a year or so alongside units of 4 BAC. This is in order to build up adequate expertise preparing for foreseeable operations. All this happens on a rotating basis.

## Heavy Lift, Digitisation

Speaking about the need for a heavy lift helicopter such as Boeing's CH-47 CHINOOK, General Gout said: "It is definitely useful. It offers benefits not so much on the tactical level but more on the operational level. It gives you the ability to put more troops on the ground, for instance as part of a deep operation". However, even if a medium transport helicopter is lacking in French army aviation, "it is not hampering the French military's ability to conduct air assault operations as the number of NH Industries NH90s is increasing", General Gout boasted. "International cooperation during operations abroad also allows us to adapt our tactics, techniques and procedures (TTPs), complementing our as-



Photo: Airbus Helicopters

**Replacing the legacy SA342 reconnaissance helicopter, Airbus Helicopters' H160M GUÉPARD (or CHEETAH) will offer multi-role capability. Seen here is an artist's impression of the H160M army variant.**

sets with larger, British CH-47 or Danish EH-101 helicopters for instance. Currently, we use the CHINOOK in Mali where the British provide them to us. However, right now it's not a priority for the army which is currently rebuilding its helicopter fleet with NH90 CAÏMAN and TIGER and is now focused on the upcoming arrival of GUÉPARD". He continued: "Another thing is: how many helicopters do we need? Per-

haps a mere ten. This makes it a costly affair as such a small fleet requires its own maintenance among others".

Using what it calls the SCORPION scheme the French has for some time been optimising its combined arms forces. In order to ensure tactical superiority in any operation that might occur, SCORPION also aims to introduce a common digitised environment into the French land forces. This is done by migrating to a new, common SICS information system, a process that commenced from 2015 onwards. In its turn, it has led the French army air corps (Aviation Légère de l'Armée de Terre – ALAT) to improving its own networked enabled capabilities by embarking on the NUMALAT (Numérisation de l'ALAT) digitisation scheme. This is aimed at ensuring compatibility of French army's rotary wing assets with the wider SCORPION battlespace digitisation efforts. General Gout: "NUMALAT is now well integrated. However, efforts to introduce it are not finished yet. It's technologically challenging and hence it takes time. This means for instance that the process of migrating from the legacy SIR regimental network to SICS in our brigade is still ongoing. We have different systems, conceived at different moments in time and it is difficult to make them communicate with each other".

## Rebuilding the Fleet

The French army currently has a total of three combat helicopter regiments (Régiment d'Hélicoptères de Combat – RHC), two being situated in the north of France at Phalsbourg (1 RHC) and Etain (3 RHC). The latter unit is also very much involved in netcentric innovation having been in-



**Illustrating Anglo-French defence cooperation, two British Army Air Corps APACHE AH1 attack helicopters operated out of Valence-Chabeuil airport alongside 3 RHC during exercise BACCARAT 2020.**



**Operating out of Grenoble-Le Versoud airport, four Airbus Helicopters TIGER HAD attack helicopters supported 4 BAC's scheme of manoeuvre.**

involved with NUMALAT since 2009. Meanwhile, 4 BAC's third regiment is located at Pau (5 RHC) in southern France, the latter unit being co-located with the 4th Special Forces Helicopter Regiment (4e Régiment d'Hélicoptères de Forces Spéciales – 4 RHFS). Although an army unit, 4 RHFS is part of the French Special Operations Command and is currently equipped with a mixture of Airbus Helicopter's TIGER, H225M CARACAL, AS532 COUGAR and SA342 GAZELLE helicopters.

Respectively in December 2013 and September 2018, Phalsbourg and then Pau saw the advent of the new NH Industries NH90 Tactical Transport Helicopter (TTH), dubbed CAÏMAN in French army service, while the venerable SA330 PUMA still soldiers on at Etain. Forming a bit of a niche fleet, most of the renovated AS532 COUGARs are today concentrated with 5 RHC at Pau. Also starting in late 2013, advanced TIGER HAD attack helicopters have been introduced at Phalsbourg and Pau.

### Future Force

Replacing GAZELLE, the versatile Airbus Helicopters H160M GUÉPARD, also known as Light Interservice Helicopter, will enter service starting 2026. According to General Gout, "3 RHC at Etain will be the first operational unit to receive this multirole helicopter. Most important innovation of this helicopter is that it will be able to conduct many different missions. It

will replace the many variants of GAZELLE but it will be able to do more. It can also perform sling operations; it has greater internal volume allowing for the transport of more personnel". General Gout continued: "While more complex, it will be

also be inherently more capable. It's more than just the replacement of GAZELLE. It will combine both attack/reconnaissance and transport capabilities, making it a true multi-mission helicopter, well suited to fulfill our requirements".

Once introduced into service, the other two regiments will also receive GUÉPARD. Etain too will see the advent of NH90 "starting 2021". Gout commented: "In the end, it is the aim of the French army to have three similar regiments although it remains to be seen how we distribute our COUGAR helicopters. Although yet to be decided, this means 3 RHC ought to receive TIGER attack helicopters as well". The French army air corps' objective at the end of the current military programming law period extending from 2019 to 2025 is to have 147 reconnaissance and attack rotary wing assets, 67 of which will be TIGER helicopters, all of which are being brought up to the HELLFIRE equipped HAD standard. What remains is a number of legacy SA342M GAZELLE reconnaissance helicopters, many of the latter fielding the Thales VIVIANE IR sight.

Meanwhile, 70 NH90 TTHs, 8 CARACAL (SOF) and 26 COUGAR support helicopters will bear the brunt of the manoeuvre and assault missions with a small number of upgraded SA330 PUMAs also being retained for the time being. ■



**Many SA342M GAZELLE helicopters continue to provide good service, complementing TIGER in the attack and reconnaissance battalions of 4 BAC's three helicopter regiments. Seen here are two VIVIANE equipped SA342M1s returning to Grenoble during this year's BACCARAT exercise.**





## Ukraine Takes another Step Forward to Reform the Intelligence Sector

Denys Kolesnyk

Last September, the Verkhovna Rada (Ukrainian parliament) passed a bill No. 2412-d “On Intelligence” intending to put in order the legislation regarding the intelligence bodies, clarifying the oversight over the intelligence agencies, and excluding the Leviathan-like Security Service of Ukraine (SBU) from the “intelligence bodies”. This legislation is necessary for Ukraine’s Euro-Atlantic aspirations and crucial for reforming Soviet-inherited intelligence services.

A year after the breakup of the Soviet Union, the Verkhovna Rada decided to establish the Security Service of Ukraine (SBU) that de facto became the successor of the omnipotent KGB since inherited the means and structure of the Soviet secret service.

Unlike Soviet military intelligence – better known as the GRU – the Ukrainian GUR MO is a subdivision of the Ministry of Defence, not the General Staff of the Armed Forces. The GUR MO, also known as Unit 0515 or the “Island”, was established mainly out of Kyiv, Odessa, and Carpathian Military Districts, as well as the Air Defence Forces, the 17th Air Army, and parts of the Black Sea Fleet staff.

In October 2004, to reduce the role of the all-powerful SBU on the one hand, and to balance the intelligence services’ activities on the other, the new intelligence body – the Foreign Intelligence Service (SZRU) – was established. This new agency was born out of the Main Intelligence Directorate “R” of the Security Service of Ukraine with 4,350 staff, including 4,010 military officers.

Despite the construction of Ukraine’s intelligence sector, the ties with Russia on official and personal levels remained close. But the 2014 Russian aggression and annexation of Crimea brought new security realities and brought Kyiv to decrease the cooperation with Moscow, albeit gradually.

The de facto intelligence cooperation between Kyiv and Moscow ceased in 2014. However, it was only in 2018 that President Poroshenko declared an official end, denouncing the agreement on intelligence cooperation with the Russia-led Commonwealth of Independent States (CIS). Despite the efforts, the Ukrainian intelligence apparatus remains associated in people’s minds with the Russians. Last summer, a new Head of the SZRU was appointed by President Zelensky, filling the void left by the previous administration. The appointment of the intelligence heavyweight Valery Kondratyuk may suggest that the Bankova (Presidential Office) expects, on



Photo: President.gov.ua

***In 2018, the Ukraine’s Foreign Intelligence Service began pulling out of the post-Soviet CIS Intelligence Services Cooperation Agreement of 1992.***

the one hand, the agency to yield better results, and on the other hand, to establish the SZRU as the leading intelligence agency.

The new bill “On Intelligence” was signed by President Zelensky into law on 21 October 2020. According to this law, only the “intelligence body of the Ministry of Defence”, in other words, the GUR MO, the Foreign Intelligence Service, and the “intelligence body of the State Border Guard Service”, have the right to carry out intelligence activities.

At the same time, according to this law, the Security Service of Ukraine remains under a relatively new term for Ukrainian legislation as an “intelligence community” and sees its duties reduced mainly to counter-intelligence activities. However, the new bill “On the Security Service of Ukraine”, that intends to replace the current law regulating the SBU that dates back to 1992, would be challenging to adopt, taking into account the divergence of positions and other, controversial aspects.

Even though it is obvious that Kyiv is struggling to find balance and to overhaul its Soviet legacy in the intelligence sphere, the process will take more time. It will be difficult for the SBU to see its powers, its staff and the field of operation reduced.

Another challenge that Ukraine has yet to overcome is continuing the process of “cleaning the Augean stables” within the intelligence community. This work is crucial not only for Ukraine’s national security but also to secure the trust of their Western colleagues that would lead to better cooperation.

# Security Landing – Germany’s Heavy Transport Helicopter Project in Limbo

**Ulrich Renn**

**O**n 29 September 2020, the Federal German Ministry of Defence cancelled the tender procedure for the Heavy Transport Helicopter because the project could not be implemented within the envisaged financial framework, taking into account all existing requirements. According to current plans, however, by the end of the year solutions are to be identified as to how the requirements can, nevertheless, be met. A solution without major changes to the main parameters of the current project is very difficult to imagine.

The *Schwerer Transporthubschrauber* project (STH – Heavy Transport Helicopter) is intended to preserve the current capabilities of the CH-53G fleet in future operations and also to provide additional special forces support capabilities and the development of Combat Search and Rescue (CSAR) capabilities.

The catalogue of qualitative requirements that the new helicopter will have to meet is extensive and very complex. The core requirements in terms of payload (ten tonnes as internal or external load), range (125 nautical miles with an internal load of eight tonnes and the option of in-flight refuelling) and speed (minimum cruising speed of 120 knots true air speed at maximum take off weight and international standard atmospheric conditions) can only be met by a helicopter that is larger and more powerful than today’s CH-53G variants. In addition, there are further requirements, which, among other things, should enable certification, interoperability with other Bundeswehr weapon systems, logistic support and continued development of the aircraft according to the Bundeswehr’s ideas.

The quantitative requirements are based on fleet performance defined according to certain scenarios, which, by imposing a specific number of aircraft to be procured, should avoid restricting competition. According to the Armaments Report of June 2019, sufficient coverage of all capabilities requires the purchase of 45 to 60 helicopters.

Timely implementation of the project is a priority in order to be able to preserve current capabilities, plus the additional capability build-up, before the CH-53G fleet reaches the end of its operational life, not later than 2030.

Photo: Bundeswehr



**A CH-53GS during the "Resolute Support" exercise. At present the Bundeswehr operates some 70 CH-53G helicopters in GS, GA and GE (training) versions.**

## Decisions

The project has explicitly been framed to acquire a system currently available on the market, not to consider a new development. It is undisputed that, after reviewing the market for transport helicopters from Western manufacturers, only Boeing’s CH-47F CHINOOK (in the extended range (ER) version) and Lockheed Martin’s Sikorsky CH-53K KING STALLION can meet the requirements of STH. Consequently, on 14 December 2017, the office of the Chief of Staff, German Armed Forces required that these two helicopters be investigated as possible solutions to fill the capability gap that would be generated by the end of the CH-53Gs’ service. In parallel to the procurement contract, a framework contract for in-service support will be agreed with the selected bidder.

Following the completion of the competitive bidding process, Boeing and Lockheed Martin/Sikorsky were invited to submit “indicative offers” on 24 June 2019. The deadline for submission was 13 January 2020; the bids were received within the deadline; were evaluated; and contract negotiations started on 4 May 2020.

If, as a result of the negotiations, the two bidders had received the invitation to sub-

mit Best and Final Offers (BAFO) in September 2020 - as was planned - parliamentary consideration (which, according to German Law, is required for all procurements valued at more than € 25M) would have been possible in March 2021 and the contract could have been concluded next year. This is no longer going to happen.

## Challenges

The German Ministry of Defence has announced that it intends “initially” to stick to the selection decision and will announce how it will proceed by the end of the year. The following statements are therefore speculative.

If the procurement of heavy transport helicopters currently fails because the finances are inadequate, resumption of the project will require a budgetary reduction. The budgetary considerations are determined by four factors (without claiming to be comprehensive, and not in the order of their importance...)

## Quality Requirements

Even if the document describing the quality requirements, entitled “Capability Gap and Functional Requirement” (Fähigkeitslücke und Funktionale Forderung - FFF) should

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remain valid - the same as the selection decision - it might still be possible to reduce the burden of the requirements to a certain extent. However, as the two helicopters are already fully developed, this can only be applied to equipment elements, the necessity of which might be questioned.

In this context, reference is often (and sometimes rightly) made to "Germanisation" measures. However, it should be borne in mind that some of those measures serve to enable certification according to national rules or to ensure interoperability with other Bundeswehr systems.

The only way to achieve greater savings is to procure another, less costly and more powerful helicopter. However, this is likely to entail extensive deviations from the FFF and, if the selection decision is maintained, a diminution of quality requirements will be formally excluded.

## Quantities

Defining the quantity requirements not based on concrete numbers of aircraft but on the required fleet performance is a good way to allow fair competition between helicopters of different performance and price. Under these conditions, if the cost of a project is to be reduced by reducing the number of helicopters to be purchased, fleet performance would have to be redefined at a lower level.

Alternatively, it would be possible to abandon this approach, to prescribe a number of aircraft for both contenders in line within the budget allocated for the project, and to accept reduced fleet performance as the only viable solution. However, in view of the recent very high demand for air transport in almost all missions, Germany's ambition is to provide essential services to the Alliance and to support smaller nations as lead nation with its own capabilities. This is in response to the shortage of helicopters in NATO, but either approach would have to be bought at the cost of significant limitations to the capabilities of the Bundeswehr and the German contribution to NATO.

## Participation of German Industry

According to the 14 November 2019 decision of the Federal Parliament's Budget Committee (Haushaltsausschusses), German industry is to be involved in the operation, logistic support, adaptation and further development of the STH. The two helicopter manufacturers have put together teams from a number of specialised German companies to meet this requirement. Soon after the announcement of the cancellation of the award procedure, comments were made which identified this requirement as a major - if not "the" - source

of cost overruns. Indeed, one must expect that the investment required to enable the German subcontractors to fulfil their roles, the costs and profit expectations associated with the subcontractors' activities and, last but not least, the cost of the complex management structures required to run the teams are likely to increase the financial burden of the project.

In addition, the subcontractors can only perform their tasks - particularly in development - if the production of the weapon system provides them with the necessary intellectual property, which is usually not free of charge.

## Changed Risk Distribution

Following problems with recent major projects, the last reform of the public procurement system aimed to shift a greater proportion of the technical and economic risk from the public procurement authority to the industrial suppliers. This approach represents a departure from the usual approach and is by its very nature not in the interests of industry. The struggle over who should bear what part of the risk and under what conditions is currently putting a strain on contract negotiations for many projects. Understandably, suppliers are keen to protect their potential profits and not to create unfavourable precedents for other contract negotiations. In principle, it is to be expected that the contracting authority will only be able to implement its ideas if it is prepared to reward greater risk exposure on the suppliers' side by accepting higher prices.

## (Im)Possible Solutions

Adherence to the selection decision indicates that there is no intention, at least for the time being, to turn away from the core STH requirements. However, if, at the same time, one wishes to return to the intended budget allocation, this would mean finding savings in other areas. Depending on how far apart the buyers and sellers are, there will have to be some more or less drastic changes. Whether, and which of them will be sufficient to provide the Bundeswehr with a much-needed, suitable replacement for the CH-53G - both in terms of quality and quantity - is not yet foreseeable. None of the interventions in the project's parameters mentioned here promises to have a major impact without corresponding disadvantages.

A possible solution (although not very attractive and not in line with the selection decision) would be to use the "Army in the Alliance" argument - currently applied to a number of other Bundeswehr capability gaps - to the STH as well. This would mean





Photo: Lockheed Martin

**The Lockheed Martin/Sikorsky CH-53K KING STALLION**

that the NH90 would be the only transport helicopter of the Bundeswehr, and that for tasks requiring more payload and/or range helicopters would have to be provided by allies - if required, and if available. This is to a certain extent already common practice in the context of close cooperation between the Dutch and German airborne forces. However, this disregards the fact that helicopters - especially heavy transport helicopters - are in short supply in all NATO nations and this solution would therefore make sovereign decisions by the German Government dependent on the will and the ability of allied nations to cooperate.

Expenditure on equipment for helicopters deviating from the "series standard" should not be so high as to allow major savings above the mandatory level. Some elements of "Germanisation" may be ex-

aggerated and dispensable, but others are directly related to the use of the helicopter according to the requirements, both operational and legal.

The classic, very effective (and even in this case perhaps unavoidable) way to achieve savings is via the number of aircraft. Both possibilities, the definition of suboptimal fleet performance or the arbitrary definition of a number of aircraft that conforms to the financial framework, can lead to considerable restrictions in the fulfilment of the Bundeswehr's mission in its current form. The path of owning a small national fleet in combination with the transfer of the remaining requirements "to the Alliance" may be a barely acceptable compromise from a national point of view, but leads to a further weakening of NATO as a whole. (Unless another nation would be willing to offer a framework for tactical airlift and

air mobility, on which Germany could rely without loss of performance).

Not involving German industry to any significant extent would probably lead to a more favourable cost structure within the project, which would perhaps be sufficient to return to the financial framework. The price for this solution would be a possible loss of industrial competence and jobs, a lower tax return from the project and less national sovereignty in the operation and further development of the helicopter.

The same applies to the question of the financial assessment of the technical and economic risk. It seems logical that not shifting the majority of the risk to the suppliers would lead to a reduction of the suppliers' costed proposals. Whether this in itself would be sufficient to save the project in its present form could only be determined if it were known what conditions the contracting authority is demanding and how the industry weighs them.

## Conclusion

It does not look as if a win-win situation is possible in the STH crisis. On the one hand, it hardly seems possible to comply with the given financial framework without accepting restrictions on quality or quantity, or without changing essential parameters that have been in place up to now. On the other hand, compliance with the financial ceilings for projects is indispensable if an attempt is to be made to bring the very extensive modernisation programme of the Luftwaffe (and the other branches of the Bundeswehr), which is the result of many years of underfunding, into line with the development of the defence budget.

Since only the purchase of one of the two helicopters will allow the project to continue as such, the likely way out of the crisis is probably to reduce the number of aircraft to be procured and to try to bring the reduced fleet performance into line with the order by adjusting the national level of ambition. Alternatively, or (if the associated savings alone are not sufficient) as a flanking measure, the procurement path (perhaps as a Foreign Military Sales case?) and the nature and extent of German industrial participation could be reconsidered.

It is possible that this crisis of the Heavy Transport Helicopter project will sharpen political awareness that even the unavoidable renewal of mission-critical parts of the Bundeswehr's equipment cannot be managed without difficult, far-reaching prioritisation decisions. The Heavy Transport Helicopter and all those who depend on it for the fulfilment of their mission must not be left behind. ■



Photo: Boeing

**The CH-47F ER CHINOOK in the configuration offered to the German Air Force**

# Lethal Aim – Virtual vs. Live Firing Training

**Trevor Nash**

**Virtual Small Arms Trainers (VSAT) have been used in conjunction with live fire ranges for many years now and although very complementary, changes are occurring that affect the fidelity of both approaches.**

Whether we are talking about armies, air forces or navies, all service personnel are trained in the use of a personnel side arm. It could be a pistol, machine pistol or assault rifle but individual training can be broadly broken down into basic marksmanship and tactical training.

## Training

The former covers handling, stripping the weapon, cleaning, clearing stoppages and sighting, procedures that occur before the individual goes to the range. Today, that range can be a virtual small arms training (VSAT) range or a live firing range. On both, the individual's skills are honed to achieve consistent results primarily against static targets at various distances with the weapon being fired from the standing, kneeling and prone positions.

Once proficient at marksmanship, the individual might undergo tactical training, normally at fire team or squad level, where fire and movement are added while engaging static and moving targets, often from behind different forms of cover such as around a wall, through a window or from a trench. This phase will also see the addition of crew-served or support weapons such as machine guns, grenade launchers and anti-armour weapons although generally, this complex level of training just involves infantry units.

Historically, both marksmanship and tactical training were conducted on live fire ranges but the past four decades have seen the rise of the VSAT. Like all aspects of virtual simulation, such devices have benefitted from the improvement to visual technology to provide brighter and more resolute images such that today, VSATs and live ranges complement each other



Photo: DVIDS

**A USMC soldier fires a shotgun at a Marathon robotic target at Camp Lejeune.**

and are frequently used in conjunction as part of a common syllabus.

## Advantages

The reason for that is the VSAT is cheaper to operate once the initial procurement cost has been amortised, it provides a repeatable environment where individuals and teams can be coached, and it provides a safe environment for new recruits and more experienced personnel that are developing fire team and squad tactics.

The hot-topic in the US at the present time is increasing the lethality of the infantry soldier, especially at the squad level, and this is driving the development of both VSATs and live-fire ranges. The Close Combat Lethality Task Force (CCLTF) that was created by Secretary of Defense James Mattis in 2018 has recognised the need to “improve training methods to meet the challenges that lie ahead,” said Col Daniel Roper, US Army (Ret) and a member of the CCLTF. These improvements include making “training more realistic”.

Central to this desire to increase lethality is the US Army and US Marine Corps aim of achieving squad overmatch, that is, “the

ability of a squad-sized unit to impose its will on a similar sized opponent under all conditions and operational environments” to win the firefight.

Many of the CCLTF's initiatives revolve around the provision of new infantry close-combat weapons but Ralph Petroff, President of Marathon Targets USA explained that, “smarter training can also make today's weapons as lethal as tomorrow's and this lethality can be achieved today for pennies on the dollar,” by using improved live-fire targetry. Marathon Targets provides a significant method of improving realistic training. Conventional ranges provide pop-up targets or mobile targets on rails or wires. Marathon's approach is to use robotic, free-moving targets that react to the actions of the firer through AI-based algorithms. As Petroff explained, “our soldiers are lethal after many reps and sets – against stationary targets but that type of training does not represent real-life combat situations.”

## Robotic Targets

Conventional gallery and electronic target ranges (ETR) are not particularly realistic

## Author

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but the problem is, as Col (Ret) Walt Yates USMC told the author, “many military procurement organisations institutionally resist the adoption of robotic targets because budgeting for a migration to a range training capability based on mobile equipment technology is a direct threat to the long protected budgets for range infrastructure development and maintenance.” In other words, there is a resistance to change that some argue is stifling innovation.

The US Marine Corps Warfighting Lab (MCWL) had sponsored a two-year End User Assessment study in 2018-2019 that looked at the use of robotic targets. As central funding was not forthcoming, this was followed by units such as 2nd Marine Division at Camp Lejeune in North Carolina, then the 1st Marine Division at Camp Pendleton in California funding their own target services that were provided by Marathon. Although internal funding is being generated by two of the three active component divisions, this still leaves 3rd Marine Division, the Marine Air Ground Task Force (MAGTF) and the reserve 4th Marine Division without robotic targets.

But it is not all about live fire ranges. CCLTF’s Roper said that, “Virtual simulations immerse soldiers in diverse, complex operational environments that replicate where they will fight, who they will fight and the terrain on which they will fight. The intent is to provide the warfighter [with] the repetitions necessary to master the skills required to win in multi-domain battle.”

One company involved in both live and virtual arenas is InVeris Training Solutions. This is a new incarnation of Meggitt Train-

ing Systems that was sold by its parent to Pine Island Capital Partners earlier this year. Alongside its legacy companies, FATS and Caswell, InVeris has fielded over 15,000 live-fire ranges and 5,100 virtual systems globally during its 90-year history. Asked how markets were fairing in the current climate, Andrea Czop, the company’s VP strategy, sales and marketing told the author that, “domestic markets are still very strong both for the live-fire and virtual segments of InVeris’ business. COVID-19 has delayed, but not cancelled some international procurements. As such, we remain optimistic.”

### Procurement Programmes

Czop’s comments on the strength of US markets is reflected by US Marine Corps and US Army domestic programmes as well as Foreign Military Sales (FMS) requirements. The USMC continues to pursue its Advanced Small Arms Lethality Trainer (ASALT) requirement and is about to embark on what it refers to as a Business Case Analysis (BCA) for development of the system.

According to the USMC’s PM TRAYSYS (Program Manager Training Systems) PMM-130, Lt Col Troy Peterson speaking at this year’s virtual TSIS (Training & Simulation Industry Symposium) event, ASALT is designed to “support Marines infantry weapons proficiency training to include basic/advanced marksmanship, team/squad drills, and advanced techniques in a simulated environment.” The new simulators should allow “Marines to increase their cognitive/

decision making and mechanical abilities through high quantity of repetitions to enhance their live-fire performance, combat readiness, and overall lethality of force.”

From the US Army’s perspective, the International Program Office (IPO) has a number of active FMS programmes that will benefit US VSAT providers. In Jordan, Cubic Defense is set to receive a contract to provide 16, 10-lane EST Next Gen training systems starting in 2021. The company will also provide EST 2000 sustainment, including spares, over a 36 month period for EST 2000 VSAT devices already deployed by Kuwait.

Colombia is set to acquire two reconfigurable virtual helicopter door gunner trainers from a competitive contract expected to be awarded in 1QFY22. Meanwhile, InVeris will provide one five-lane EST and a mix of wireless BlueFire and tethered weapons representing the M4, M269, M240, GLOCK19 along with spares and initial training to Tonga in FY22.

Domestically, the US Army is in the process of advancing its 20-year Future Army System of Integrated Targets (FASIT) programme. This is a massive requirement that is designed, ‘to provide the Army with standard target systems and architecture which includes Government Off The Shelf (GOTS) software for range operating systems,’ explained Michael Willoughby, product director for future training solutions.

Key to the multi-award programme is for industry to provide the US Army with sufficient spares to sustain operations for a minimum of 20-years and develop ‘a single universal target control software’ system for 659 live-fire ranges.



Photo: InVeris

**A FATS 180MIL VSAT from InVeris Training Solutions**

According to Willoughby, these ranges include 60,848 Stationary Infantry Targets (SIT), 5,668 Moving Infantry Targets (MIT) and 2,980 falling steel plate targets.

The Orlando-based Program Executive Office Simulation, Training and Instrumentation (PEO STRI), the technical authority for FASIT said the programme will also provide: Downrange Presentation Devices that interact with the control software and provide scoring feedback; battlefield/weapons' effects devices that simulate combat situations including visual and sounds effects; and finally, targets/silhouettes that provide visual, image intensification and thermal representations of friendly and OPFOR targets.

In essence, FASIT is adding to the realism and fidelity of the live-firing range by making them more akin to VSATs in terms of the number of different training scenarios that they can create.

Eight companies already provide elements that will comprise a part of the overall programme and these will need to be accommodated as part of the overall award. These companies are: General Dynamics Mission Systems, Riptide Software, ZelTech Training Solutions, Theissen Training System, Sius Target Systems, Strategic Systems, Saab Training USA and InVeris Training Solutions. Some examples of these interdependent FASIT sub-systems include Riptide Software's Targetry Range Automated Control and Recording (TRACR) system that the company developed and for which, it is the current prime contractor. Developed in 2006, TRACR is currently deployed on over 250 ranges worldwide and is part of the US Army Common Army Ranges and Target Systems (CARTS) programme.

ZelTech provides the Army Battlefield Effects Simulator (BES III) under a contract awarded in September 2019. BES provides visual and percussive feedback to soldiers during live fire training exercises.

CARTS providers include Theissen Training Systems, InVeris Training Solutions and Saab Training USA for targets and Location of Miss and Hit (LOMAH) while Sius Target Systems provides its LOMAH electronic scoring systems.

General Dynamics was awarded the Consolidated Product-Line Management (CPM) contract from PEO STRI to consolidate the management of the Army's (Live Training Transformation (LT2) product line. LT2 currently includes more than 150 training ranges providing training for individual soldiers up to and including full brigades participating in live force-on-force and force-on-target training.

As we have already seen, when it comes to individual, fire-team and squad weapon



Photo: InVeris

**A LOMAH device fitted to a pop-up target**

training, VSATs and live-fire ranges are totally compatible and complementary. Numerous studies have shown as far as marksmanship training is concerned that soldiers trained using VSATs produce more accurate results and pass qualification tests sooner on the live-fire range than soldiers not using such devices.

The result is a saving of time and money and therefore the uptake of VSATs from companies such as Thales Deutschland, Laser Shot, RUAG France, Indra, InVeris, Cubic and Saab continues.

The US domestic and allied FMS markets are massive, driving considerable VSAT output and so it will be interesting to see if the transformational Synthetic Training Environment (STE) programme, with its emphasis on Reconfigurable Virtual Trainers (RVT) will tip the market balance away from the historic providers of such systems to companies such as Aegis Technologies that is currently developing RVT devices.

Earlier this year, the US Army cancelled its Squad Advanced Marksmanship Trainer

(SAM-T) programme, with funds supposedly directed into STE.

STE is likely to be a game changer in terms of 'revolutionizing training through technology' according to Maj Gen Maria Gervais, Director of STE's Cross Functional Team. What is clear is that the US Army is maximising the opportunity provided by STE to integrate and define operating standards across the board for its synthetic training capabilities in the future.

STE's aim is to have devices such as the RVT that are able to network with other virtual and constructive training devices to collectively simulate much larger units and operations at any point on the globe. Gervais said that 'the next big challenge would be the integration of live training'.

FASIT and STE have major similarities in that both are all encompassing and trying to rationalise what historically, has been fragmented training. Both are also heralding an increase in fidelity for small arms training. ■

# Sims versus Reality: Training JTACs

**Alan Warnes**

Military ranges play an important part in training service personnel, particularly the joint terminal attack controller (JTAC). These facilities, which can often be thousands of square miles, as in the USA, are where skills are honed.

The increased importance, in recent years, of the JTAC in places like Afghanistan and Iraq, means the need for realistic training, in areas where live weapons can be regularly used. This can involve fighters, weapons, bombers working with personnel on the ground, but it is expensive, and with overstretched defence budgets, more innovative and cheaper methods of doing the work are continuously being looked at. Today, we have an increasing amount of simulation work in JTAC exercises, like Ample Strike formerly known as Flying Rhino, in the Czech Republic. Czech Air Force Colonel Zdenek Gabriel, the Exercise Director at AMSE 2018, the last time there was a real full-scale exercise told the author, "Our aim is to offer live-fire simulations and demanding scenarios based on NATO standards." Many of the roles are being fulfilled by civilian companies, not just with aircraft equipped with various sensors, but for simulation on the ground. One obvious issue with setting up a JTAC or forward air control exercise is the obvious cost of creating the scenarios, and that is where simulation comes into play. Often, there is a lot of pretending – pretending there is a target, pretending there is a bomb being dropped and pretending there is a downlink from the aircraft.

However, companies like Bristol-based Close Air Solutions, with their JTAC simulation systems can get around all that. The company was set up in 2012 by two ex-RAF Tornado pilots, Mike Squires and Tom Ball. They had worked at the Joint Forward Air Control Training and Standards Unit (JFACTSU) at RAF Leeming before leaving the RAF, and could see simulation was a great method

Photos: Alan Warnes



**JTACs embedded among the ground troops call in air assets, to take out 'unfriendlies'.**

of capability-specific training for JTACs. Squires, an ex-Tornado pilot and Business Director told the author in September 2018: "Our systems meet the standards of accreditation laid down by both NATO and the US, and if you meet those standards, the guys can count the JTAC controls, as if they were training with real aircraft in the field." He adds: "There is quite a compelling business case for using simulation. We can put hundreds of assets on the ground and in the air, whereas using live is very expensive. For example, if the RAF uses a Typhoon, that would cost around £100,000 per hour. To fly around in circles! Whereas we could put up a virtual Typhoon and the JTACs can still count it in their logbooks."

The up-side is the JTACs get the right ticks in the boxes for their currency, at a fraction of the price of using real assets. But is it credible? As one JTAC told the author, "Both of them, simulated and live, have their unique role in the training." The simulated missions allow instructors to efficiently adjust the training to every individual, from basic to very complex scenarios, and replay the mission in detail to get the best results from the training. Meanwhile, the live training incorporates manoeuvre of the unit, physical movements, live fires, and real stress in the

moment of releasing the ammunition from the aircraft somewhere above your head or firing from the mortar somewhere behind the hill. Both, simulated and live trainings, are invaluable and irreplaceable parts of JTAC's training.

## Techniques Employed

JTACs need to understand the techniques employed to control an aircraft. This will include the communication of co-ordinates, of the enemy's position to the aircraft normally via a Rover terminal. They will also have to read a map, understand the weaponry to target the 'unfriendlies', and the types of weapon you can use.

As an experienced pilot, who served as an Airborne Forward Air Controller (AFAC) in Afghanistan told me, "with simulation you miss the reality of the ground situation. The way the JTAC is taught is highly intensive usually, 'east versus west' scenario and risk-adverse but the reality is the enemy is very difficult to find and are often among civilians. The targeting has to be very precise as does the weapons – the calls of 'Danger Close' means the friendlies are in striking distance of the bombs and the pilots need to remember that. The understanding of

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the weapons effect isn't taught properly in Europe and in some countries pilots do not even understand what a Mk 82 has been designed for!"

In the haze of war and the frenetic pace of the action unfolding, the difficulty is often to understand the situation. Where is the friendly forces line (known as Nine-Line)? Are you liaising with the air commander? Assessing the situation? Asking for air support? Analysing the air support options and sending in an unmanned aerial vehicle for some real time tactical reconnaissance?

Sometimes, there is even the problem where the JTAC might not understand the foreign accent of the pilot. In Afghanistan, several JTACs told the author it was particularly difficult to understand French accents. The former AFAC continued: "Simulation is great for pushing buttons, on the radio and other equipment but is difficult to provide the complexity of war, and especially the unknown, when for example the engagement is a surprise. Synthetics ensures people stick to the basic principles, but it doesn't provide the effects."

For the air-to-air mission, simulation training is more effective than that of the ground training. A NATO pilot said: "You can select your AIM-9 SIDEWINDER or AIM-120 AMRAAM, and once fired, it's all about the weapon. When it comes to the ground requirements, it's all about getting to the target but you cannot simulate the weapon

and see the effects, which means the pilot is not learning."

The UK military sees synthetics as a solution to cutting training costs across many roles. In the UK, Elbit Systems was awarded a US\$38M contract for joint-fire simulation training (JFST) in mid-2019, to train the British Army. Under the contract, Elbit Systems UK is providing both fixed and mobile systems that comprise multiple networked simulators to train mounted and dismounted Joint Fires Teams and Joint Fires Cells. JFST systems will also support exercises for reserve forces and teams deployed at sea, such as those onboard the Royal Navy's QUEEN ELIZABETH class aircraft carrier.

JFST is set to replace existing capabilities currently provided by Distributed Synthetic Air Land Training 2 (DSALT2) and the Close Air Support Simulator (CASS) at JFACTSU based at RAF Leeming, as well as other legacy capabilities.

The first Joint Fires Mobile Trainer (JFMT) was built by UK-based D3A. A company spokesman told the author in September 2019, "We serve JTAC currency in the UK military, which has over 300 JTACs. Our customer is the 1st Brigade, Royal Artillery and their 140 JTACs and many currency requirements. The UK is now at the stage where it has a limited number of aircraft, and this sim is accredited by US and NATO to cover six out of the 12 JTAC requirements." He added, "We liaise with the military unit to identify their



**The first JFMT, a small trailer-like cabin, was used at Ample Strike, where JTACs from several NATO countries got the chance to get their qualifications updated.**

military needs, and can set up their mission scenarios inside 90 minutes. The JFMT was set up within the past year, it costs less and can provide more direct training and was the only such simulator in existence."

So while many trumpet the use of simulation which definitely has its place, the need for reality training still remains, for now anyway. ■



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# Merging Cyber into a Multi-Domain Common Operational Picture

**John Antal**

## Lessons from the Design of Commercial User Interface

**M**ulti-domain operations across the five domains (land, sea, air, cyber, and space) are not new, but new technologies are changing the methods of war. Advances in Artificial Intelligence (AI), microminiaturization of electrical components, and robotics are driving these changes. An Internet of Battlefield Things (IoBT), similar to the com-

mercial Internet of Things (IoT), but with deadlier effect, is emerging. War will be faster and deadlier than ever before. The fusion of networked sensors with projectiles, and the synchronization of the kill-web by AI, will strike targets in multiple domains at hyper-speeds. To act decisively in this complex environment, commanders must visualize the battles-

pace from the adversary. Accelerating the OODA loop will require enhanced cognitive computer systems that can depict the multi-domain battlespace in actual time on a common operational picture (COP).

Decision makers in business use versions of COPs to visualize complicated information in several domains and military developers can learn from these best practices. Although the consequences are less lethal in commerce, the outcomes often involve the success or failure of multi-million-dollar efforts. Commercial software systems, like their military counterparts, use a User Interface (UI) as the point of human-computer interaction and communication with a device. If done well, UI speeds up synergy and comprehension. The commercial electronic and gaming industry focus on clear, easy-to-use, and self-evident UI. The best UI solves the problem without overwhelming the user and makes operations easier and more effective.

Currently, the information needed for a cyber COP to conduct cross-domain maneuver is neither holistically displayed in all five domains, generated automatically, nor easy to comprehend. War fighting information is depicted in large headquarters on multiple screens cluttered with icons in layers of increasing complexity. Staff personnel working within information silos create most of the data that appears on these screens, with the corresponding human time-lag. This information is assembled in a "kill chain" to attack targets. The current kinetic kill chain (find, fix, track, target, engage, and assess) works fine for single actions, but will take too long to apply in multi-domain operations against a peer adversary. A solution is to learn from commercial real-time systems and data presentation in real-time video games to develop a cyber COP as part of a multi-domain visualization that will assist in executing an AI assisted kill web. Taking the best lessons from commercial UI design, here are seven principles to develop a multi-domain COP.



Photo: US Army photo, Program Executive Office Enterprise Information Systems

**Visualizing battle in multiple domains is challenging. To conduct cyber operations and synchronize the effects in multiple domains, military leaders must have a Common Operational Picture (COP).**

### Author

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pace, see actions as they occur, predict possible effects, more rapidly than the enemy.

Human decision-making rests primarily on pattern recognition. Commanders observe, orient, decide, and act (the OODA Loop) by recognizing the pattern the enemy has presented and rapidly applying a counter-pattern. If you can do this faster than your opponent, the enemy will appear to be acting in slow-motion. It is as if a boxer is landing four or five blows for every one

## Holistic View

In any battle, the whole is more than the sum of its parts. Actions occurring on the flank of any battlespace can quickly turn decisive. A commander must see all the factors of the fight that are occurring in the battlespace in real-time and be able to depict plans and future operations. A holistic view combines several domains and the actual world to see more than the sum of the parts. Cyberwar actions, integrated with the actual world and other domains, are superior to a single domain visual. Seeing friendly and enemy cyber-actions as they occur, overlaid onto a real-world setting, allows the commander to form a holistic vision of the battlespace. In the commercial sector, the John Hopkins COVID-19 dashboard is an example of a holistic COP. From this dashboard, the user can track the number of global cases and then dig deeper to find out the figures by nation, city, and region. This dashboard is so up-to-date and trusted that many health providers and governments consider it the standard for COVID-19 information. The UI depicts

the data on a world map and the user can tap down to any desired area. In addition, the dashboard depicts the testing, tracking, contact tracing, information on vaccines, news, and resources, providing a holistic view of the current pandemic situation. Similarly, a military multi-domain COP must depict the actions and effects of multiple domains over an area of interest.

## Self-Evident

Anything displayed on a COP should be axiomatic. Symbology that is not intuitive fails. Think of your smartphone. Users buy a phone and begin using the device with no training because its iconography is self-evident. The touch-and-activate UI that then cascades into expanding information on demand is what should be the standard for a multi-domain COP. Real Time Strategy (RTS) computer and console games provide an example of self-evident displays that take little training time. In these games, the UI depicts multiple actions in real time. Timing is critical in massively multi-player online (MMO) games where play-

ers battle other human players in sports or battle genres. A generation of people have been playing MMO games since the beginning of the Internet. Games such as World of Tanks and War Thunder, which boast thousands of users every day, are realistic and immersive experiences. World of Tanks, by a Belarusian company Wargaming.net, claims 180+ million players worldwide. In these games, speed matters as players operate tanks and other military equipment in multi-player battles over realistic terrain in real time. The simple and intuitive UI best-practices of these games is the principal reason for military developers to take notice.

Minimalist: The best commercial UI designs offer only required or essential features. The goal of every UI design should be simplicity and ease of use. A video game titled Metroid Prime, developed by Retro Studios, is an excellent example of a minimalist UI design. The UI in Metroid depicts everything in the game in a diegetic view from the character's helmet heads up display (HUD). In this diegetic view, we see the elements in the game in a first-person perspective. The



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HUD in these games is usually a piece of equipment, such as the helmet visor from a suit of powered armour. In games with vehicles, we see a virtual cockpit. Military designers can learn from this diegetic view for helmet mounted or virtual cockpit systems. A helmet mounted

Multiple Forms of Feedback: Your smartphone helps you to navigate your car from one point to another with audio and visual cues. For a multi-domain COP, designers should consider multiple forms of input, to include tactile stimulation such as the vibration stimulator in an X-Box One con-

## Automated

To conduct cross-domain manoeuvre in real-time, we must act faster than the current human staff process allows. Staff silos must give way to secure and automatic reporting and integration, with Human On the Loop (HOTL) oversight. Fighting in real-time requires a COP updated by IoT sensors. An example of a user-friendly commercial real-time, automated COP is Meta-Trader 4 (MT4), developed by MetaQuotes Software Corporation. Foreign exchange (forex) traders use MT4 to get advice, news, alerts, and analysis to trade forex in real-time, with instant execution, from a personal computer, tablet, or smartphone. Although this software deals primarily with one domain (forex trading), it does so in real-time, with automated inputs that provide the essential information and predictive analysis for decision-making. Imagine the reaction of a commander with a multi-domain COP that is suddenly “lit up” with cyberattack alerts. To conduct cross-domain manoeuvre, the cyber slice of this multi-domain COP must automatically depict when and where every system in a unit is operating, emitting, which is being attacked, and offer options to deal with the threats.

Cyber operations must be placed within a multi-domain COP for the warfighter to see the full battlespace. To conduct cross-domain manoeuvre, operators must see the relevant domains on-demand, in real time, and with predictive analysis. The predictive analysis part is crucial. Realtime is not enough. The hyper-speed of future battle renders realtime events as past actions for human cognition. To adapt to the changing circumstance the commander needs enhanced cognitive AI to predict what is likely to happen next. As the realtime fight is occurring, the COP must help the commander visualize the fight in “predictive time” and see how actions might play out. Visualizing all domains in one integrated COP, and providing predictive analysis, is beyond human cognition and requires enhanced systems with robust AI. Those who master advanced methods to synchronize, visualize, predict, and execute combat in this multi-domain battlespace with a multi-domain COP will gain a tremendous advantage. War is not a video game, but visualization systems in the commercial sector provide powerful lessons for military developers to improve how warfighters see and operate cyber operations in the multi-domain battlespace. ■



Photo: US Army image

**Raytheon Corporation developed the Electronic Warfare Planning and Management Tool depicted in this image to generate common operational picture for Electronic Warfare (EW).**

multi-domain COP, similar to the helmet capabilities of an F-35 pilot, which provides an augmented reality (AR) view of the real-world, could benefit from the minimalist design concept from video games like Metroid.

## Reduce Cognitive Load

Information overload is a hazard. In battle, information overload is deadly. A multi-domain COP with recognizable symbology and other cues can reduce the cognitive load on the warfighter similar to the navigation software on your smartphone. Today, most people use their smartphones to navigate by automobile from one location to another. The smartphone navigation system tells you point-by-point directions by voice and shows the vehicle direction and location on a map in real time. No need to glance at notes or a paper map. The driver keeps focused on driving while receiving information. This is an excellent example of a system that speeds up the driver’s OODA Loop while reducing the driver’s cognitive load.

troller. With this additional UI, the controller vibrates when triggered by explosions or dangerous events in the game, alerting the player. In a similar fashion, the UI of a multi-domain COP might alert the operator to a dangerous or significant event.

## Configurable and Locus of Control

The UI should be customizable and configurable so that the operator can fit the UI to the circumstance, and they can add shortcuts to display or execute repetitive actions. Besides being configurable, the UI of the cyber COP should give the operator confidence that they control the system, and not the other way around. The COP is a primary means for Human On the Loop (HOTL) control of AI. User control, called locus of control in psychology, is as vital in a multi-domain COP as it is in the rifleman’s confidence when looking through a rifle sight, squeezing the trigger, and firing a shot that knocks down a target. They gain this confidence when actions deliver multi-domain effects in real-time in the battlespace.

# Viewpoint from New Delhi

Photo: Suman Sharma



## National Interests and Trade Dictating Alliances in Indo-Pacific Region

**Suman Sharma**

Long before European maritime explorers navigated the Atlantic and discovered faraway eastern lands, Chinese Admiral Zheng He had already explored the “West Oceans” with ten famous voyages – using large armadas – over a period of two decades in the early 15th century. These maritime passages were aimed at establishing and maintaining order, securing safe passage and trade relations throughout the region that encompassed the South China Sea, Indian Ocean, Persian Gulf, the Malacca and Hormuz Straits.

Six centuries later, having been forced to act as a result of China’s recent aggressive posturing, nations seem to be aligning along small and large groups, intent on forming an Indo-Pacific tapestry, driven by a strong trade element, but also by an underlying military current. France was the first European nation, followed by Germany, both of whom have articulated inclusivity, free passage, and an international rules-based order in their Indo-Pacific policies.

Each nation’s potentially conflicting interests is turning out to be an impediment rather than a strength in holding together a large group under a common umbrella. While France and Germany, both European Union (EU) members have shown initiative, there is currently no sign of a common EU strategy being elaborated. Walter J. Lindner, German Ambassador to India says, “We would like to show inclination for a partnership with those countries which share the same values as us. As for a common EU strategy on the Indo Pacific, we will take it up with France, and then within the EU and see if a common strategy can be built on.” An Indian diplomat (not wishing to be named) adds, “Most European countries had left security matters to the US, while dealing with China economically. But now they are rising to the security challenge, as China has reached Europe through its BRI (Belt & Road Initiative), lease and debt diplomacy, and the ongoing pandemic. Smaller countries like Hungary, Greece have their own economic interests, so it is difficult to say if a single and common EU strategy would work for all.”

Meanwhile India, which is considered as the pivot to the Indo-Pacific and is part of almost all groupings connected with it, is moving ahead in aligning with nations bilaterally, trilaterally, and multilaterally. The first ever trilateral Indo-Pacific meeting between India, Australia and France was held virtually in September under a Track-2 initiative. The French Government, in its 2018 policy framework, reiterated the economic importance of the Indo-Pacific region, with the French President noting that, “Our goal is to act as a stabilising mediating power.” Though nations have maintained that the strategy was not aimed at

cornering China and was commercially, rather than militarily driven, but with logistical support agreements signed by India with Japan, Australia and the US, and similar agreements between Japan and its western allies, such as Canada and UK, and the US 7th Fleet patrolling the Indian Ocean, all cannot be without reason. France maintains its military bases in Djibouti and the UAE. With billions riding on trade with China, each nation is treading cautiously.

It is interesting to note that in March 2019, the European Commission in its economic relation review document with China proposed ten action clauses, out of which two stood out:

- To safeguard against potential serious security implications for critical digital infrastructure, a common EU approach to the security of 5G networks is needed.
- To detect and raise awareness of security risks posed by foreign investment in critical assets, technologies and infrastructure, Member States should regulate screening of foreign direct investment.

Six centuries ago, Zheng He was able to achieve a peaceful trading relationship with a vast maritime footprint; this is a vision sadly lacking in today’s China.

### Quad

Former Japanese Prime Minister Shinzo Abe who coined the term ‘Democratic Security Diamond’ in 2012 for the Quad, is sadly no longer in office to witness the maturing of his successfully crafted foreign policy doctrine. The Quad’s first foreign ministerial meeting outside the UN was held in October in Tokyo between India, the US, Australia and Japan. Shinzo Abe’s ideological overtures have elicited the desired response in terms of bringing together likeminded nations, when a recent Quad-Plus virtual meeting was held with participation from New Zealand, South Korea and Vietnam.

While India’s Foreign Minister Jaishankar applauded the wider acceptance of the Indo-Pacific strategy, US Secretary of State Pompeo, in a vocal rebuke of post-COVID-19 China, pointed the finger at the Chinese Communist Party saying, “As partners in this Quad, it is more critical now than ever that we collaborate to protect our people and partners from the CCP’s exploitation, corruption, and coercion. We’ve seen it in the south, in the East China Sea, the Mekong, the Himalayas, and the Taiwan Straits.”

# Continued Controversy Surrounding French RAFALE Fighters

**Suman Sharma**

**The French fighter jet RAFALE, which is India's first major fighter acquisition in over two decades, is entangled in a different kind of a dogfight in India.**

The deal has drawn criticism ever since Prime Minister Modi announced that the RAFALE was now India's preferred choice during his visit to France in April 2015. When the contract was formally signed in September 2016, the deal was worth almost US\$7.945Bn for 36 aircraft; the first batch was delivered in July 2020. Where are they now though?

The most recent "shot fired" at the fighter jet deal is the current audit report tabled in the short session of Parliament recently concluded in September by the national audit watchdog, the Comptroller and Auditor General – more commonly known in India as "CAG". The question is, how long can the RAFALE deal dodge criticism?

Two CAG reports were purported to have been released last year, one dealing with the contract and the other regarding off-sets set aside for Indian businesses. ESD readers will recall past dispatches about the increasingly fervent "Make in India" policy. However, only one offset contract has been awarded thus far - just before the second quarter of 2019 – and just in time for the national general elections, which, according to the main opposition party Indian National Congress was a move designed to prevent any embarrassment for the ruling party.

Opposition leader Rahul Gandhi's entire election campaign was centered around the allegation that PM Modi had approved an over-priced deal to accommodate an offset contract for Indian businessman Anil Ambani's inexperienced defence company, Reliance Defence. This is a claim that was dismissed by the Modi government without any concrete argument, while Rahul Gandhi tweeted last year claiming: "Money was stolen from the Indian exchequer in RAFALE", and quoted Mahatma Gandhi's words: "Truth is one, paths are many".

The Modi government assured the Parliament that the second report dealing with offsets would be tabled (i.e. made public) in 2019 soon after the elections. It did not, however. Just recently, in September

Photo: author



**A RAFALE at the Aero India tradeshow in 2017**

– more than a year after being promised – the report has been issued, exposing irregularities in the offset contract.

In the RAFALE contract, the offsets were fixed at 50 per cent, which meant that half of the US\$7.945Bn was to be set aside for India by the four French partners – Dassault Aviation, MBDA, Safran and Thales, along with almost 100 private Indian and government companies, all of whom were free to choose their respective offset partners. The largest amount of the offsets were to be discharged by MBDA - 57 per cent - and Dassault Aviation (makers of RAFALE) at 58 per cent, to be spread over a seven-year period for the completion of the offset obligation. Out of the 50 per cent off-sets, a 20 per cent share was allocated to the Indian private sector and the remaining 30 per cent was reserved for the government-owned premier military research agency – Defence Research and Development Organisation (DRDO).

## Indian-Style Graft

While Dassault and Reliance Defence basically formed what can only be described

as a "joint venture", Reliance also partnered with Thales to provide other RAFALE technologies and services – e.g. radar maintenance and electronic warfare sensors – for the Indian contract as well as for the global market. Other partnerships that subsequently took shape were between the Indian Government-owned Hindustan Aeronautics Ltd (HAL) and French Snecma for aero-engine components; and, India's SAMTEL with Thales for multi-functional cockpit displays.

Last year, amidst the political storm surrounding the deal, more powerful allegations came to light about the Government's preferential corporate partnerships for the US\$4Bn offset part of the contract. Modi's Government revealed the republished financial figures on the costs of the RAFALE deal in Parliament, with the important disclaimer that these figures did not take into account the cost of India-specific modifications and services - such as life-cycle costs - and tried to address allegations as to whether or not India's Cabinet Committee on Security had been truthfully informed on the deal.

## The Current Audit Report

The recent CAG report extensively adds to the level of discourse that has so far involved a good deal of political “cloak and dagger” behavior from both the Indian Government as well as the opposition. Mounting attacks on the Government, the Congress-led opposition have demanded transparency, thereby bringing the controversial deal back into the limelight prior to upcoming elections in some crucial states in the country.

In its report, CAG observed the following discrepancies in the offsets of the deal.

- Dassault Aviation, along with MBDA, were required to disclose their offset partners when the Inter-Governmental agreement was signed in September 2016, with the separate offset contract signed at the same time. Changes made in India’s Defence Procurement Procedure are cited by the watchdog as reasons for facilitating the waiver of this clause, thereby enabling Dassault to circumvent the disclosure of their offset partners.
- Offset obligations take effect from the third year on, which in this case is September 2019. Since this discharge period had already begun, CAG put pressure

on the Indian MoD to obtain details on what was being offered by the vendor, as well as the details about partners. This request was ignored.

- To bolster its domestic industrial base, DRDO wanted to obtain five critical pieces of technology from Dassault Aviation; this was denied by the French aviation manufacturer, citing that: “Most of them were not within the vendor’s core competence”. DRDO subsequently elaborated a sixth proposal, namely, technical assistance for the Indian jet engine (Kaveri) for their indigenous Light Combat Aircraft. This proposal was also not confirmed by the vendor, forcing CAG to admit that it is not clear if even this technology transfer will take place.
- Other provisions desired by the Indian side included simulators, manufacturing spares to be integrated into global supply chains, and depot level maintenance facilities; none of these have been fulfilled yet, however.

When answers were demanded of the French manufacturer RAFALE, the company released a statement stating that; “it will share any details of its offset partners only after three years of the contract”, which was September 2019. This commitment has also not been honoured, as even after

one year, details of the offset disclosure remain unclear from Dassault’s side.

The MoD’s response to CAG’s queries were not forthcoming either. Instead, the report stated that: “The MoD has denied any information related to the RAFALE offset deals to the audit.”

Former Defence Minister Nirmala Sitharaman, in office until last year, defended the Government saying: “There is a year-wise phasing of how much offset obligation the original equipment manufacturers have to fulfil. The MoD informs me that claims of such obligations being fulfilled are coming in.”

CAG slammed the Government on the grounds of ‘negligible foreign direct investment’ coming into the country and the domestic industry being denied any high-level technology so far, further complaining: “Offset discharge is short of target for which no penalty has been levied and collected as mandated.”

CAG has called for a major revamp of the entire procedure governing offsets, on grounds that it has “scarcely met its objectives” of acquiring advanced technology and buttressing the domestic defence industrial base, notwithstanding the fact that India is one of the top weapons importers in the world. ■

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# Record Levels of Indian Missile Testing Amidst Ongoing Border Standoff

**Suman Sharma**

**In little over a month, India has carried out ten missile tests, including most recently with its indigenous nuclear-capable NIRBHAY subsonic cruise missile, equipped with a locally manufactured MANIK engine, giving it a range of 1,000 km.**

The Indian Government-owned defence research agency DRDO (Defence Research & Development Organisation) has thus created a record of sorts by bombarding the Wheeler Island test range in the western Indian state of Odisha after conducting high-tech tests against the backdrop of the ongoing Indo-China border standoff, now in its sixth month.

Dr. W Selvamurthy, former Chief Controller of Research & Development, at DRDO, echoed President Reagan's words from 1983, stating that "India has never indulged in aggressive posturing, but strength respects strength, therefore all these tests have come at the right time as global signaling was important. Technology drives the doctrine of a nation, both in war and peace. DRDO's mandate has been to keep up with the critical technologies whether supersonic or hypersonic."

Missile tests carried out by DRDO since 7 September:

- NIRBHAY subsonic cruise missile – 12 Oct 2020
- Anti-radiation missile – 9 Oct 2020
- Supersonic missile assisted release of torpedo – 5 Oct 2020
- Supersonic SHAURYA strategic missile – 3 Oct 2020
- Laser guided anti-tank guided missile – 1 Oct 2020
- Supersonic BrahMos cruise missile – 30 Sept 2020
- Night trial of strategic missile, PRITHVI II – 23 Sept 2020
- Laser guided antitank guided missile – 22 Sept 2020
- ABHYAS high speed expendable aerial target – 22 Sept 2020
- Hypersonic Technology Demonstration Vehicle – 7 Sept 2020

The latest test involving the subsonic NIRBHAY missile with its sound barrier-breaking speed is a terrain-hugging, sea-skimming system capable of deflecting enemy radar

through its stealth characteristics. It manoeuvres with its delivery platform before striking the target with a high degree of accuracy.

Lauding the work of the DRDO, Dr. W Selvamurthy adds, "In the past five years, DRDO has been performing at a significantly high level and has demonstrated its capabilities, especially through missiles such as the SHAURYA. Then there is the anti-radiation missile which is a great nuclear asset and the hypersonic missile with its 4-7 Mach speed is a game changer. All these systems are nuclear capable and match global levels of effectiveness. The DRDO has done a commendable job."

The anti-radiation missile (RUDRAM) – a potent weapon – is the first indigenously manufactured anti-radiation missile designed for the Indian Air Force (IAF). It can be launched from the IAF's frontline Sukhoi-30MKI fighter and is capable of engaging radiation targets with pinpoint accuracy, and neutralise enemy air defence systems.

The supersonic missile assisted release of torpedo (SMART) is an effective weapon system designed for anti-submarine warfare (ASW) operations far beyond torpedo range.

## Decades of Innovation

DRDO, which was founded in 1958 to boost indigenisation within the Indian defence industry, launched its missile development programme in 1982 under the guidance of one of its most competent aerospace scientists, the late Dr. APJ Abdul Kalam, who would go on to become President of India. It is understood that DRDO received orders from on high to fast-track its missile programme in the early days of the ongoing Indo-China border standoff, thereby resonating Prime Minister Narendra Modi's clarion call for a 'Self-Reliant India' or 'Atmanirbhar Bharat'.



**An Indian PRITHVI II missile launched on 11 March**

DRDO began the latest series of tests with the Hypersonic Technology Demonstrator Vehicle (HSTDV) in early September, followed by the extended range version of the Indo-Russian land attack supersonic cruise missile, BrahMos, featuring its indigenous booster and airframe – along with other 'Made in India' sub-systems – cruising at a top speed of Mach 2.8, and successfully engaging targets 400 km away. The nuclear-capable SHAURYA supersonic missile has been hailed as a new-age weapon, traveling at two to three times the speed of sound, capable of carrying a nuclear warhead weighing around 200 kg and flying at 2.4 km/s. The Indian Government has cleared the system for introduction into the military's missile inventory. Under the direction of the National Security Council, the Indian Strategic Forces Command will decide upon its future deployment in due course. The laser guided anti-tank guided missile (ATGM) for the Indian Army's indigenous main battle tank, ARJUN, was also test fired, though the service was equipped last year with 210 Israeli SPIKE ATGMS deployed along the Indo-Pakistan border in the western theatre of operations.

Most of these weapons are ready to be introduced operationally and are simply awaiting final clearance from on high. ■



# Austria to Partner Italy on Joint Helicopter Project

**Georg Mader**

**On 21 September, the Austrian Defence Ministry endorsed earlier recommendations of the Armed Forces' General Staff and agreed to procure 18 multi-purpose helicopters as a G2G solution jointly with Italy.**

In a press conference with Defence Minister Klaudia Tanner, CGS General Robert Brieger and the specialist officer responsible for procurement, Colonel G Reinhard Zmug, media representatives were informed about the choice of the selected partner country and the helicopter type – the Leonardo AW169M. In general, an open RFP to manufacturers in a competition including offsets, was ruled out in advance in light of the negative experience from the controversial 2003 EUROFIGHTER procurement procedure, which was subsequently labelled as politically 'toxic' as a result of scandals and media reports. Consequently, Vienna was looking instead for a partner country, to be chosen from among the 27 states the RFI was sent to in 2017. At the press conference, the Defence Ministry confirmed that Italy would partner the Austrian military in all areas of procurement and operations of these military helicopters over the entire lifetime of a 'cost-optimised' system. It was also revealed that Italy would itself procure up to 100 AW169s, of which 40 will be of the same type as the Austrian demand for a 'light multi-role helicopter' to replace the remaining 19 vintage ALOUETTE-III, in service with the Austrian Armed Forces ever since 1967.

## Details Need to be Fixed

As regards Italy, the announcements made on this project so far are yet to be set in stone. But since the AW169 (UH-169 – Italian name) is earmarked to replace all AB205, AB212 and AB412 models of the Italian Army (Esercito) Aviation Brigade, one can count on this project happening. However, the numbers foreseen for the



Photo: LEONARDO

*The Agusta Westland 169MA*

military version, otherwise known as the 'green' model of the AW169M, which also happens to be the same variant chosen by Austria, is so far only fixed at 15 helicopters. Included among the 40 units mentioned, there are 22 'yellow' civil-equipped variants for the Italian Finance/Customs Police – Guardia di Finanza – to be delivered by 2023 and two UH-169B training aircraft already delivered for the Army Brigade's type-conversion. These two, and the 'yellow' versions are equipped with wheeled landing gear, while the Italian and Austrian 'M-models' are being ordered with skid gear which is currently being tested towards certification, together with the changed rear horizontal stabiliser fins on the fourth prototype I-AWCM. This, together with all other equipment and outfitting details, in addition to the demand for a simulator in Austria, are to be defined by the end of the year with the Italian MoD and the manufacturer, Leonardo. Nevertheless, an ambitious and detailed timeline has already been published.

## Top Quality Equipment – Lacking in Quantity

After years of difficult internal political wrangling, from 2022 onwards, top qual-

ity, modern military equipment will be entering service and Austrian airmen/women can finally be pleased with these developments. Despite the previous unfortunate practice, which was necessarily presented as a 'disaster control package' in 2018 by a previous government, it was decided to 'sell' the project to the public as a 'strong investment' in the safety of Austrian soldiers and in the population at large. While the latter assertion might be unquestionable, one cannot help but note that this is not the case when it comes to the numbers of platforms currently foreseen in the project.

## USA and Germany – Empty handed

While the sum of €300M will now be transferred incrementally to Austria's southern neighbour, it was emphasised that this would cover the entire procurement procedure (the helicopters, ground equipment, logistics, training elements and related infrastructure needs). On the other hand, an estimate of total lifecycle costs (an issue which was deemed as being insufficiently considered in the EUROFIGHTER purchase, and which drew heavy criticism in the three investigative parliamentary committees) has not yet been published, nor even discussed.

## Author

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

## ■ ARMAMENT & TECHNOLOGY

After all, while the chosen model is the most powerful of the three models on offer, it is also widely expected to be the most expensive in terms of running costs. And Austria's Army is well-known for being chronically underfunded since its creation in 1955.

In addition to the AW169, also under closer consideration were the notably smaller Bell-429 and the Airbus H145M, with the latter also sold as a military version to Serbia and also to Austria's neighbour, Hungary. In explaining the final decision, it was clarified that the US offer was in fact much closer to the original 'ALOUETTE'-sized intention, and though supported by the US Government, close cooperation in operations, logistics or training was essentially ruled out because this variant is not operated by the US Armed Forces. In military markings, it flies only in Australia (Navy), Tunisia and Jamaica (National Guard) and Oman – all non-options when compared to a partner in a neighbouring EU country. Germany would also certainly have been an option, but the official explanation was that an upcoming German procurement of 60 H145M would only begin in October 2024, and including an introductory phase until 2025, this would mean a capability gap in Austria, where the ALOUETTE fleet is earmarked for retirement in 2023. An Airbus manager, however, explained to the author only a few days before the public announcement, that they expected the first of the 60 German units earlier, and that those 18 production slots foreseen for Austria could even have been 'reserved' or safeguarded already if a 'mandate-contract' with Berlin had been concluded, in the same way Austria has used for the MRV DINGO for example. And at the end of July, Airbus Helicopters presented the 5-blade prototype T3 in Wiener Neustadt, in much the same way Bell did one month later in Bad Vöslau. The main obstacle

Photo: LEONARDO



**The AW169B delivered first for army aviation training**

against choosing Airbus – apart from the very public (and unjustified) remark by Defence Minister Tanner that "everyone knows my relationship with Airbus", referring to the EUROFIGHTER – is the fact that the German military is planning to rely on its own industry for logistics and maintenance. Austria would not want that option (thereby benefiting its own maintenance centre – Fliegerwerft) at Aigen im Ennstal AB) meaning a deeper cooperation with the German Army would be impossible.

### Already One or Two Steps Ahead?

It is still not known whether, or at what point, the project officers communicated the potential partner countries or names of the manufacturers, something they are not denying to media representatives (including the author) as a 'motivating factor'. That is to say, in some form of 'advanced impact assessment', one might already have considered that in the years leading up to 2030, the necessary replacement of 23 AB212s (introduced from 1980 onwards) and 10 OH-58Bs (from 1976 onwards), could result in an equally lengthy dispute. Subsequently, it appears that the procurers were open, or at least receptive to the fact that a helicopter with significantly more transport space or MTOW could also be

possible compared to a tight-fitting ALOUETTE replacement. Because for a long time, and as explained to the author by an Ex Chief of the AUT Air Force, Leonardo had only communicated the option of the AW109 TREKKER (with skids). Meanwhile all these elements can be summarised in such a way that Austria was looking for an 'all-rounder'. Since an all-rounder would offer the largest possible 'total lift' transport space of what would only be a two-type fleet. This might be understandable, but it should be borne in mind that based on the transport space that is (still) available today, 36 AW169Ms should have been bought; either this option, or a follow-up order of the same type, if possible.

### Training as the Drawback?

At first glance, it might be surprising to learn that six of these 18 five-tonne machines are also intended to be used for helicopter training at the military flight school in Langenlebarn. Regarding the already mentioned issue of chronic underfunding, the AW169M has the highest flight/hour costs of the three candidates. In addition, for initial basic training needs, a machine that does as little as possible 'by itself' or is less automated than others should be used, not least since it is the 'basics' of a rotary winged aircraft that should be conveyed. The official response to this is that there is an advantage to be had of using an identical helicopter, both for operations and training, since the aircrews would spend most of their careers operating these training helicopters and – as seen in Italy – a conversion to an operational type is no longer necessary. The two Italian UH-169B, however, are to be employed exactly for that type-conversion, and not for basic training. In the meantime, however, after further discussions, it has emerged that the initial pilot screening/training could be carried out on the OH-58B until such time as it will be withdrawn from service, or organised alternatively with

Photo: LEONARDO



**The Italian Air Force introducing its first AW169B for army aviation training**



Photo: OBH

**At a press conference in September 2020, Austrian Defence Minister Klaudia Tanner and Austrian Chief of General Staff Robert Brieger informed journalists about the choice of the Leonardo AW169M.**

civilian partners on the Robinson R-22, or similar model. The MoD notes that its training courses are currently conducted in the operational squadrons, but will be assigned to the training helicopters (of the same type) thereby freeing up the operational squadrons for other tasks and missions. This would result in higher availability for operational tasks so the six machines intended for this role, or which are rotating through this function, should be “as identically equipped as possible”.

### A Military Tool as well

The answers provided by General Brieger on 21 September regarding specific military equipment and armament to be fitted to the new helicopters should be welcomed. It was informally communicated to the author on an earlier occasion that the armament option would not, or at least not for now, be discussed publicly due to the Greens being a coalition partner with the party in charge of the MoD, the ÖVP. So far, the discussions have all been about search and rescue, protection and assistance roles. Gen. Brieger nevertheless now underlined, that the new aircraft will also be adapted for military tasks and suitably equipped for working with Special Forces, with sensors for air reconnaissance, self-protection systems, and also armaments as part of the pro-

urement process. This is not foreseen at the outset, but rather further down the line, towards full operational capability (FOC), around 2025-26. Subsequently, the following weapon systems are being examined: 12.7mm MG or 2cm cannon pods, guided or unguided rockets (ideally including a laser guided missile), a FLIR, which can be used not only for aerial reconnaissance tasks, but also for precision targeting and an integrated weapons computer, able to support vision systems. The armament – Leonardo has already issued its concept drawings – could be fitted on pylons which could be mounted

and dismantled within a matter of hours, on to some aircraft within the fleet. The armament itself would not come from Leonardo, while the exact nature and specifications, and whether there will be a simulator in Austria in the final stage, are all issues to be negotiated in detail, including with the Italian partner.

### Conclusion

It was actually high time for an injection of ‘fresh blood’ in the Austrian inventory for the designated units – from the helicopter squadron itself, to the Aigen maintenance centre, and the air-and air-defence forces school – all of which are now facing a modernisation push, especially in terms of electronics and digitalisation. However, they will probably cope with this transition just as successfully as they did with the generation-skipping switch from the Saab ‘DRAKEN’ to the EUROFIGHTER over 10 years ago. Regarding the costs, or future operating expenses, these are mostly tied to the chosen partnership with Italy on the AW169M. Comparisons cannot only be made by the unit price (between EUR 8M and 15M, related to the various mission-related packages), but the capabilities of the helicopter also need to be considered, such as speed and range, suitability for high-altitude/mountain ops, number of seats, external payloads (weapons or a fire fighting role), avionics equipment, etc. All mentioned comparisons of hourly running costs (Bell about EUR 800, H-145 about EUR 1,000 and AW169 EUR 1,300) are from a database used in civil aviation and refer to the civilian variants and related to the military/operational capabilities mentioned above. The more extensive cooperation with the Italian partners, the more the opportunity will arise to reduce the cost per Austrian flight hour. ■



Photo: BMLV

**Austrian Defence Minister Klaudia Tanner at Aigen Airbase**

# France Prepares for New Truck Competition

**David Saw**

France is preparing to start the process for the acquisition of a new family of trucks to replace its existing logistic vehicle fleet, with the call for tenders due to be released in the near future. Arquus, effectively the French national champion in terms of trucks and logistic vehicles, held a demonstration at Satory near Versailles in September 2020, of its new ARMIS truck family, the basis of their solution to the future French military truck requirement.

Arquus, or rather its legacy companies, have been the leading supplier of tactical trucks and logistic vehicles to the French Army effectively since the French Army started acquiring trucks. The Berliet CBA of 1913, more than 30,000 acquired, was critical for French logistics in the First World War. French artillery depended on the Latil TAR artillery tractor, 3,000 trucks acquired. Then there is Renault who supplied 10,000 trucks to the French Army during this period. From that point on, the majority of the trucks supplied to the French Army would come from Arquus legacy companies. In 1955, there is a merger of 12 French truck manufacturers, including Latil, Renault and SOMUA, into a new company called Saviem that produced some 18,000 trucks per year. At that time, the primary French competitor in terms of trucks was Berliet, but in 1978, both Saviem and Berliet became part of Renault Véhicules Industriels (RVI). Later the defence business would be known as Renault Trucks Defense (which would form the basis of Arquus). In 2001, RVI became part of the Volvo Group, with Arquus being established as the Volvo Group's Defence Business Area in 2018.

## Current French Truck Fleet

Today, Arquus has a dominant position in the French Army truck fleet, starting with the VLRA for example. This vehicle was produced by ACMAT at Saint-Nazaire (the company was acquired by Renault Trucks Defence in 2006), in production since the early 1960s. More than 12,000 have been produced in 4x4 and 6x6 versions for the French Army and foreign customers. The French Army and French Special Forces acquired 1,800 VLRA in some 75 different variants, with some 500 currently in service. Arquus developed a new generation VLRA

Photo: Nicolas Broqueidis



**The Arquus ARMIS 6x6 climbs a 50% slope at the Satory test track in September during a demonstration. The ARMIS family has three variants: 4x4, 6x6 and 8x8. Arquus believes that the ARMIS family is the ideal choice for the future French Army truck requirement.**

(originally known as the VLRA 2, but now just called VLRA) and this VLRA chassis also provides the basis for a whole range of APCs such as the BASTION, PATSAS, FORTRESS and FORTRESS Mk2.

In terms of in-service trucks there is the TRM2000, a 4x4 vehicle with a two-ton payload, produced from 1982 onwards. More than 2,000 of these trucks were acquired by the French Army. Arquus received a contract to renovate 200 of the oldest TRM2000 trucks in service before the end of 2021, with the first 15 being delivered to Nouvelle-Calédonie in February 2020. Another truck acquired in large numbers, some 15,000, from 1977 onwards was the TRM4000 with a four-ton payload, though the majority have now been retired.

The TRM10000, produced from 1987, is a 6x6 vehicle with a payload in the 10-16 ton range. 5,000 vehicles were originally acquired and 1,000 are still in service. The

TRM700-100 is a 6x6 tractor unit with a 60 ton payload, used as a tank transporter amongst other missions. Acquired from 1993 onwards, there are over 100 in service. The Arquus SHERPA truck family should also be mentioned; 77 of these are in service as the platform for the CAESAR self-propelled gun, with 30 more used for general transport tasks. In 1997, the French Army started acquiring the Renault KERAX 8x8 truck. This was a commercial vehicle and 400 of these were acquired, with Arquus bringing these vehicles up to military specification.

There are a significant number of Berliet trucks still in service with the French Army. The starting point was the GBC8KT, a 6x6 vehicle with a six to ten ton payload, with 17,000 vehicles produced from 1959 onwards. Then in 1997 work started on an upgrade of the GBC8KT to the new GBC180 configuration. The chassis of the old vehicle was retained, but everything else

was changed, such as a new engine and transmission and a new cab. Some 5,000 GBC180 remain in service with the French Army. Arqus is also under contract to extend the service-life of the GBC180. 150 upgraded vehicle were delivered in 2019. The Arqus relationship with the French Army is not just a matter of providing new trucks, under the MSSPL contract. Arqus is responsible for the support of the 10,000-strong French Army truck fleet on a daily basis. This is carried out at more than 300 service locations that Arqus has in France and France d'outre-mer, while the Arqus logistics hub at Garchizy is responsible for the supply of spares to the service centres or to units directly. In 2021, Arqus at Saint-Nazaire will be the central point for all maintenance, repair, overhaul, life extension and upgrade activities for the company.

## The New Era

The French Army is now in the process of looking to replace the majority of its existing truck fleet and some 7,700 tactical and logistic trucks are to be acquired. It is expected that a call for tenders will shortly be announced. This French requirement is a key programme for Arqus and they have developed the new ARMIS advanced truck family to meet this French requirement and to meet the needs of future export customers. The ARMIS family consists of 4x4, 6x6 and 8x8 vehicles.

The ARMIS 4x4 has a payload of two to four tons and is powered by a 340 hp Euro 5 engine that is derived from that used in the Véhicule Blindé Multi-Rôles (VBMR) GRIF-FON armoured vehicle. The ARMIS 6x6 has a payload of four to eight tons and is powered



Photo: Arqus

**Arqus has been the primary truck supplier to the French Army for more than 100 years. Current in-service Arqus trucks with the French Army include the TRM family (shown here). More than 18,000 TRM trucks have been acquired in four main variants.**

by a 460 hp Euro 5 engine derived from that used in the Engin Blindé de Reconnaissance et de Combat (EBRC) JAGUAR. At the top of the range comes the ARVIS 8x8. This has a payload of 32.5 tons in its unprotected version and a 520 hp Euro 5/6 engine.

In developing the ARMIS family there were a number of key design criteria; for example mobility. To this end, Arqus developed new fully military specification drivelines. In addition, they can utilise Automatic Traction Control (ATC) developed by Volvo Trucks, to optimise vehicle mobility. Modularity was also important as the trucks will have to undertake a wide spectrum of missions, requiring numerous variants and sub-variants. Protection is an important factor, requiring the provision of cabs protected to

STANAG 4569, amongst other features to defeat ballistic, mine and IED threats. Moderate maintenance costs are essential. To this end, Arqus have integrated predictive maintenance technologies. What Arqus is intending to achieve is best-in-class capability across all ARMIS family configurations.

At the September demonstration in Satory the ARMIS 6x6 variant was the centre of attention, providing a mobility display across the Satory test tracks. The primary objective here was to demonstrate visibly the performance advantages of the new ARMIS vehicle over previous generation military trucks. The ARMIS 6x6 is described as a rugged and versatile platform capable of troop and cargo transport, as well as carrying 10 or 15-foot shelters; it will also form the basis of a range of tactical transport and logistic vehicle variants. It is envisaged that all ARMIS trucks will be integrated into Scorpion (Synergie du contact renforcé par la polyvalence et l'info valorisation), the battle management system of the French Army

Another advantage of the ARMIS design is that from the very beginning it has been designed to support upgrade, through the integration of new capabilities, and service life extension. Taking into account the growing pressures to be more environmentally conscious, Arqus are already working on hybrid designs and even new power sources such as hydrogen for its military vehicles.

For more than 100 years Arqus have been the dominant truck supplier to the French Army, it is a position that they are determined to keep. With their new ARMIS truck range they believe that they have the means to keep their position as the dominant truck supplier in France. ■



Photo: Arqus

**A GBC180 truck going through a life extension programme at Arqus Limoges. The French Army currently has some 5,000 GBC180 in service. Arqus is under contract to extend the service life of the truck, with 150 upgraded GBC180 delivered in 2019.**

# Viewpoint from Tel Aviv

Photo: via author



## Israel-US Priorities – the Next Four Years

Tamir Eshel

**F**ollowing four years of Israel's right-wing romance with the Trump administration, this euphoria ends when a new resident enters the white house. While Israel and the Middle East are not likely to be the main concern for an ongoing or new

administration, some changes are expected to pose challenges and open new opportunities for Israel and the region.

After eight rough years under President Obama and Joe Biden as Vice President, Israel could not expect a better Presidency and administration than the Republican Party under Trump. US politicians have always supported Israel but also expected Jerusalem to be lenient toward the Palestinians. As a president-elect, Joe Biden and Vice President-elect Kamala Harris are not expected to be an exception. However, with new members in the Democratic Party representing some radical ideas, this party could pose some challenges to Israeli politicians.

### Securing Israel's Qualitative Military Edge

Regardless of who takes the White House, the continued special military funding and support to Israel's security will continue. Reiterating US commitment to secure Israel's qualitative edge, Brad Schneider (D-IL) introduced bipartisan legislation to guarantee the commitment to Israel's military edge in the Middle East region. "For decades, Israel has been a key strategic ally and friend of the United States, and it is crucial that we do everything we can to support our allies," said Congressman (R-PA) Brian Fitzpatrick. "Despite the incredible steps towards peace that have been made, there are still plenty of entities that wish to harm Israel. This is why it is so important that we support Israel and help to preserve its Qualitative Military Edge (QME), to ensure the safety of the Israeli people and maintain stability in the region."

### JCPOA to Challenge to Jerusalem – Washington Relations

Another problem for Israel and the entire region is the 'Joint Comprehensive Plan of Action – JCPOA' or the 'nuclear deal' with Tehran that will soon be back on the table. Without Trump at the helm, the White House is likely to be ready to move closer toward Iran since a Democratic administration drove and approved the original accord in 2015. By 2021, this agreement will be in its sixth year, allowing Iran to renew its nuclear weapon development without restrictions by 2030.

Removing Iran's sanctions will fuel Iranian influence in the Middle East, which has suffered quite a few dents in recent years. With Iran remaining the primary security concern for the US and its regional allies, the US remains attentive to Israel's security needs. Such commitment could translate to the QME expand into even closer cooperation, providing access to intelligence

and early warning capabilities, improving early warnings for the region, and facing the Iranian missiles attack.

### Gaining Defence Market Share in the Mid-East

Trump made a radical change in US policy toward the Middle East by encouraging nations in the region to ally with Israel without involving the Palestinians in such agreements. The move has led to the new peace accord with UAE, Bahrain, and Sudan, strengthening the region and, eventually, enabling Washington to focus on its primary security concern - the Pacific region.

The plan also opened significant opportunities for US defence industries, with the sale of fifth-generation fighters and MQ-9 armed drones. These sales were previously restricted under Israel's Qualitative Military Edge (QME) legislation, preventing advanced military hardware sales to countries potentially hostile to Israel.

Although the proposed sale of F-35A to the UAE and, potentially, Qatar and Saudi Arabia is a game-changer in QME terms, Israeli concurred with this precedence, realising the benefit the new peace accord yields.

For the US defence industry, the new sale soles two significant issues encountered in the Middle East market - the loss of the Turkish F-35 order and restriction of sales of armed drones in the region. China quickly filled the void created by the drone restriction and sold armed drones to Saudi Arabia, UAE, Egypt, and Jordan. By offering MQ9 REAPER drones to the UAE, Washington would regain some of the market share lost to the Chinese.

### Joining the Negotiating Table?

A new administration could rekindle the pressure to get Israel and the Palestinians closer. Although the 'Abraham Accord' is part of President Donald Trump's legacy, the accord received broad bipartisan support in Washington. A new administration is likely to reap the fruits of this accord by continued support for conciliation between Israel and the moderate nations in the region. A first sign would be a Palestinian move to reopen their security cooperation with Israel. The Palestinians suspended this sensitive but strategic arrangement that helps combat terror and extremism in the West Bank in protest of Israel's peace agreement with the UAE and Bahrain. A Democratic White House will be able to invite the Palestinians to join the agreements and gain some of the influence they have lost in the past four years.

While Israel's Likud Party and Benjamin Netanyahu opted to back the Republican Party and President Trump in the 2016 elections, they refrained from repeating this stand in 2020. Many Israeli politicians maintain close relations with Joe Biden. These special relations could pave the way for continued coordination of interests and a future for a stable and prosperous region.



# Viewpoint from Bonn



## Good Luck, Joe Biden

**Rolf Clement**

By the time this issue goes to print, the ballots in many US states are still being counted. But it is very likely that Joe Biden has won the presidential election in the United States, making this one of the most important election results in recent years.

It is, firstly, because it is the President of the USA. But it is at least as important that it was not won by a man who completely disregards all democratic rules and the values that Western democracies (should) stand for. Trump's behaviour in recent years has shown this sufficiently. This week it became abundantly clear: until the election, it was inconceivable that a president still in office would come up with the idea of using the Supreme Court to stop the counting of votes because his majority was dwindling. Or that, when the postal votes are counted, he would seriously claim that his victory is now being stolen because votes for his opponent would suddenly make his own lead dwindle. Trump's victory would be a great encouragement to the Erdogans and Putins of this world. It would also give a boost to those in Europe who are at the edge of our political spectrum with a different understanding of democracy. Biden's victory brings stability back to the US democratic order, which radiates to all European countries. This victory brings the chance to stabilise the rule-based order, as it is so often called, in the international community, too. However, it is not only Trump that has upset it, but others as well. But at least one of the destabilising factors has gone. That is a very important result of this election, with implications for the world.

What does Biden mean for us Europeans in terms of security policy? First of all - and we appreciate this after four years of Trump - we again have a partner who listens. Arguments and facts will again play a role. Conflicts and different opinion can become manageable. We are dealing with a President Biden who has no deep aversion to international cooperation. You can work with him in the organisations. After the Trump years, we like to glorify the era of Obama, of whom Biden was Vice President. Obama, too, has shifted the focus of his foreign policy efforts to the Pacific. He, too, has seen China as his main rival, the ever-increasing role of which in the world has long been relevant to security policy. That will not change with Biden. But Europe plays a different, more positive role with him. Since he pursues a value-based policy, he knows that he has a partner in Europe despite all its shortcomings.

And it is also true that Trump's slogan "America first" is, if we take it seriously, a perfectly normal attitude of any statesman. That a responsible politician looks after his country and its citizens first is his normal duty. We in Europe are not used to such statements, because open representation of one's own interests is considered improper. It is about two things: how do you represent your interests - and how do you define them?

We will certainly now be meeting the kind of United States of America, which will once again become more internationally active. International issues have continued to play an important role in US policy over the last four years. Just think of North Korea, relations with China, the US involvement in NATO's presence in the Baltic states - all issues that do not indicate a purely domestic agenda. That will not change.

Biden will not completely change the helm on some issues. He has announced that the USA will rejoin the world climate agreement. With him, there will be an attempt to launch a new initiative in relations with Iran. He may not reinstate the old agreement, but he will make proposals for a new one. He will also try to withdraw from Afghanistan, but he will not do so unilaterally, but will coordinate with both the government in Kabul and with allies. These are three examples that show how things could go: On some points, Trump decisions will be reversed, on others, there will be a change of direction, and others will continue to be implemented, but in a cooperative style.

In some areas, the US positions were correct even under Trump. The "No" to NORTH STREAM 2, for example, is well justified from a security policy point of view. Without sanctions against the companies involved, this position would have been discussed differently. So the USA has a point from which even a Biden administration will not deviate.

Under President Biden, the USA will be a good and committed partner in NATO. This does not mean either that the exhortations to Europeans to do more for their security will disappear. The decision to spend two per cent of the gross national product on defence has been taken by NATO on several occasions, including under Obama/Biden - unanimously, which is often forgotten. The USA "only" admonishes the Europeans to implement what they promised.

This expected new - or again old? - attitude of the USA towards Europe will facilitate the discussion here. Biden will be more credible as a guarantor of our security, despite the fact that he represents US interests - Europe's freedom is perhaps even one of them. The alliance will become one again. In doing so, Biden is of course initially counting on the larger countries, on Great Britain, France and Germany. This increases the pressure on Europeans to come to a greater degree of agreement on this continent. Poland actually belonged in this list. We will see how Biden will deal with the Trump-like government in Poland.

So the conflicts and differences of opinion between Germany and Europe on the one hand and the USA on the other will not be resolved by this election. But they will no longer be instrumentalised against each other, instead, solutions will be sought. That gives us room for manoeuvre, also for us here in Europe. And it creates new stability.

In this sense: Good Luck, Joe Biden.

# Autonomous Warriors

**Tamir Eshel**

**The idea of human surrogates waging battles or superior entities fighting against mankind has evolved in cultures throughout the world for centuries.**

**M**achine-based semi or fully autonomous 'robots' have appeared in literature since the industrial revolution of the late 1800s and evolved in the science fiction genre throughout the 20th century, and also in the early 21st century but without ever becoming a reality – until now.

Enabling technology for remotely controlled fighting machines has been available for more than a century - primarily in the form of different versions of unmanned platforms that first appeared in WW I. These platforms included remotely controlled weapons, such as naval torpedoes and remotely controlled vehicles. Improvements in propulsion, communications, and recognition have brought about platforms that are now more sophisticated. These possess higher levels of automation and autonomy, particularly after the introduction of computer technology on board unmanned aircraft, thereby enabling the machine to make decisions at a level authorised by the system's developers and controllers. By the end of the 20th century, the addition of improved sensors, coupled with the ability to carry guided weapons, heralded a new era of unmanned warriors. Armed, land-based robots, however, were

Photo: US Army



**The M1150 ASSAULT BREACHER at the US Army National Training Center**

not viewed as mature as the unmanned drones. In the early 2000s, at a time when weaponised drones were operating in the skies, conducting a similar activity on land was believed to be neither feasible, nor affordable, as demonstrated by the robotic vision outlined by the US Army's (failed) Future Combat System.

Fast-forward two decades, and we see that technology and affordability are no longer the limiting issues they once were. Instead, the Army is determined to induct robotics into its ranks, but in the right way and this trend is evident throughout the world. With some of the most potent weapons coming under public scrutiny and banned by international treaties, military establishments understand the risks involved with weaponised robotics and try to alleviate public concern that such technologies might possibly spiral out of control.

The evolution of commercial robotics has reduced the barriers to military robotics, with the introduction of new sensors, improved signal processing, and more advanced computing - all necessary for autonomous control. Furthermore, efficient and affordable propulsion and energy storage capacities, together with advanced communications, now enable these unmanned systems to operate at extended ranges, employing robot-to-robot and robot-to-human operations. Robot effectiveness and affordability introduces a dramatic new dimension as robotic systems are becoming an integral part of combat formations, or are taking advantage of autonomous performance to a new level with the fielding of robotic 'wolf packs' or swarms.

Photo: CMU NREC



**The BLACK KNIGHT robotic combat vehicle**





Photo: CMCU NREC

**The BLACK KNIGHT human-machine interface**

“Battle labs” established by militaries and research organisations have explored those concepts for years. In fact, in recent years some of those studies have been applied in the field, primarily in the USA, UK, Russia and Israel.

### Robotic Sentries

In 2008, Israel became the first nation to use unmanned ground vehicles (UGV) operationally, deploying the GUARDIUM, a vehicle based on the US TOMCAR all-terrain vehicle along the Gaza Strip border. The GUARDIUM was unarmed, and employed to patrol the border, taking some of the operational workload off the Israeli Defence Forces (IDF) and Border Police. While the GUARDIUM has since been discontinued after a few years of service, lessons gained during that period were instrumental in developing a more advanced version by 2016. The successor to the GUARDIUM is a robust, spacious, teleoperated vehicle based on the Ford 350 chassis: it is now better equipped to integrate with the operational rigours associated with a border monitoring and patrolling role.

While deploying robotic ‘guards’ along the border with the Gaza Strip, the IDF continued research and development of combat robotics, evaluating the feasibility of deploying such robots with combat formations. The most feasible option was using robot-vehicles for reconnaissance, autonomous logistics supply, combat engineering, and advanced guard elements. An operational capability demonstration performed in 2018 has shown a combined

operation of such capabilities in an urban warfare scenario.

### Beyond Border Guards

Up until 2020, the IDF fielded some of these weaponised assets, including utilising the General Robotics’ lightweight PITBULL remotely operated weapon station. The PITBULL has been mounted on RoboTeam’s PROBOT UGV deployed with the IDF’s new GHOST special mission brigade and on ARGO UGVs. The latter has been included as an element of the experimental ‘smart and lethal border’ programme undertaken by the IDF as part of its four-year plan known as “Momentum”.

While sentry missions for UGVs have offered clear gains, military forces neverthe-

less expected more from their robots. By 2018, technologies were mature enough for the experimentation of more advanced robotic concepts by combat troops. The UK and Australia have pioneered these activities and, as part of the four-week ‘Autonomous Warrior Exercise 2018’ (AWE-18), British troops and industry partners tested more than 50 new technologies. Almost at the same time, the Australian Defence Science and Technology Group held another experiment – an autonomous warrior exercise featuring naval and land-based robotic systems. These experiments involved small combat units given various robotic systems ‘to play with’, experiments that provided designers lessons about challenges that their systems may encounter in the field, and valuable end-user experience from the troops. They also provided the military with insights into these new technologies and were able to tweak the design systems in preparation for deployment.

As European armies ‘play’ with robotic platforms, Qatar has shown its determination to embrace this new trend, becoming the launch customer of Rheinmetall’s MISSION-MASTER platform. In 2018, the German company established a joint venture with the Qatari Emiri-owned Barzan Holdings, forming Rheinmetall Barzan Advanced Technologies (RBAT) with plans to develop UGVs further. One year later, their UGVs were displayed at the National Day military parade in Doha in December 2019. Two vehicles were shown in the baseline mule configuration while the other two were configured to carry a reconnaissance payload, mounted on a telescopic mast. Qatar is believed to be deploying these UGVs as part of an autonomous security force guarding strategic coastal infrastructure and sensitive facilities. While the current



Photo: US Army

**The MET-D based on a modified M2 BRADLEY at robotic vehicles tests at Ft. Carson**

Photo: Milrem Robotics



**The Milrem Robotics TheMIS at the Autonomous Warrior Exercise 2018**

deployment includes unarmed platforms, the goal is to equip the unit with robotic weapons platforms; weapons carrying stations, guided or unguided rockets, and the use of loitering munitions are just a few of the available options.

Medium-size load carriers proved particularly useful in these demonstrations. Among these was the TITAN, a modular UGV based on the hybrid-powered TheMIS platform. This vehicle, developed by the Estonian Milrem company, provides a tracked platform able to be reconfigured in the field as a load carrier, operate with reconnaissance equipment, evacuate casualties, and operate weapons, including lightweight guided missiles (e.g. JAVELIN) or machine guns.

### Load Carrying Mules

Following a long evaluation of different squad multipurpose equipment transport (S-MET) UGVs, the US Army selected the General Dynamics Land Systems (GDLS)

8x8 multi-utility tactical transport (MUTT) for the Army's future robotic mule. A contract worth \$249M was awarded to GDLS in July 2020. S-MET provides the capability to carry most of the squad's excess equipment, and generate and offload power for charging batteries and powering additional mission equipment, while operating as a dispersed and decentralised force in challenging and diverse environments for extended periods. The 8x8 MUTT variant weighs about 3,500 lbs and carries up to 1,200 lbs of payload. The US Army plans to develop modular mission payloads and integrate them with the S-MET Increment I platforms to increase system capability. The Army plans to field S-MET in the second quarter of the fiscal year 2021 and complete the deployment of 624 S-METs by the second quarter of fiscal year 2024.

Back in the UK, experimentation and capability development continue following the experience gained during AWE-18. While that exercise utilised systems loaned by industry, the UK has opted to buy a few

robotic platforms for further experimentation. In March 2020, the British Defence Science & Technology Laboratory (DSTL) received two TheMIS tracked vehicles. Based on the TITAN design developed in cooperation with QinetiQ, Milrem Robotics is participating in two large-scale UK robotics programmes – JTARR (joint tactical autonomous resupply and replenishment) and RPV (robotic platoon vehicle). Two MUTTs were also delivered from the USA and in July, RB-SL delivered four 'cargo' variant MISSION MASTER UGVs. These vehicles can operate in autonomous or semi-autonomous mode via remote control. They are amphibious, highly mobile across all types of terrain, and integrate with the combat network via digital and audio communications. The vehicle can carry up to half a ton of cargo and can be configured in the field to carry medical equipment, including two stretchers for casualty evacuations.

### Battle Tested Robotics

The civil war in Syria has also provided opportunities for the testing of robotic systems concepts. A 12-ton remotely controlled, tracked armoured vehicle known as URAN-9 has been under development by the 3rd Central Research Institute of the Russian Defence Ministry since 2015. Remotely controlled from a follower vehicle, URAN-9 mounts a single barrel 2A72 30mm cannon, four 9M120 ATAKA anti-tank guided missiles and 6-12 SHMEL-M rocket flamethrowers. In 2018, the prototype was deployed to Syria as part of a combat experiment conducted by the Russian MOD. The first experience with the robot tank was poor. Frequent communications failures and performance issues with the stabilisation of the primary weapon and optronics prevented the robot tank from being a useful battlefield asset. Following this combat experience, the robot was returned to Russia, and transferred to the Kalashnikov group, where it is expected to undergo further improvements before its inclusion in the armed forces' inventory. Russia has not been alone in its quest to field weaponised robots. The US Army began exploring the prospects in the mid-2000s. By 2006, the US Army began testing the BLACK KNIGHT unmanned armed combat vehicle developed by BAE Systems. This turreted robot tank was equipped with a 30mm cannon and an optronic suite comparable with that of main battle tanks. Multiple LIDAR sensors were used to scan the area in front of the tank enabling the robot to move off-road autonomously. Controlled from an M2 Bradley vehicle, BLACK KNIGHT could also execute

Photo: Milrem Robotics



**A TYPE-X robotic combat vehicle**

planned routes, manoeuvre off-road and avoid obstacles – all without operator intervention, thus acting as a cavalry wingman. When dismounted operations are required, soldiers can continue and operate the robotic vehicle through a dismounted control device.

### Embracing Combat Robotics

Despite an early start, the US has not truly embraced combat robotics until relatively recently. As part of its defence realignment designed to keep pace with its adversaries, the US considers unmanned capabilities a critical element in the Army's ability to deal with a fire-saturated and access-denied battlespace. Having combat robots establish initial contact with the enemy provides its combat formations invaluable intelligence about enemy plans, intentions, and actions; it also enables its forces to direct an actionable response against the enemy's main thrust. The Army is currently evaluating a cavalry scout platoon comprised of four robotic combat vehicle (RCV) surrogates using modified M-113s fitted with panoramic vision, a remotely controlled electro-optical (EO) payload and a weapon station. These



Photo: USMC

**A tracked 4x4 Multi Utility Tactical Transport (MUTT) vehicle**

RCVs are controlled by two mission enabling technology demonstrator (MET-D) vehicles using modified M-2 Bradley AFVs. Each MET-D accommodates four operator stations, for two crewmembers controlling each M-113. This experimental unit was formed in 2018 and began testing in 2019. The platoon recently completed a two-week test at Fort Carson, where the unit performed basic techniques in-

cluding area and route reconnaissance, and screening. The experimentation has provided the Army an insight to some of the benefits and challenges of operating robotics in combat, such as the advantage of deploying vehicles more flexibly, and the challenges of off-road driving, particularly on downslopes, as well as performing remote operations when the MET-D was mobile. Communications also proved

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Photo: Textron Systems



**The RIPSAN M5 Robotic Combat Vehicle (RCV)**

challenging, though the Army intends to integrate a more advanced communications system with waveforms optimized for data transfer and remote control. A more complex company-level experiment is foreseen for 2022 that will involve four additional MET-Ds, controlling eight new RCVs.

In the coming years, the US Army plans to evaluate three classes of combat robotics – light, medium and heavy variants. Earlier in 2020, two companies were contracted to deliver such robots by the end of next year. QinetiQ US will deliver four light robotic combat vehicles (RCV-Light) based on its 3.5-ton expeditionary modular autonomous vehicle (EMAV), a versatile tracked flatbed able to mount 3.5-ton payloads in support of dismounted infantry operations.

Simultaneously, Textron Systems will deliver four medium weight (RCV-Medium)

platforms weighing 10.5 tons. These are tracked vehicles designed to carry a payload of four tons. The vehicle uses the protector medium calibre turret (MCT), mounting a 30mm cannon remotely operated from the operator's control panel. Similar to manned vehicle applications, the UGV turret provides precision target acquisition and manoeuvre support up to ranges of 3,000 m with automated slew-to-cue and hunter-killer functions and target sharing capability between vehicles. Following company-level experimentation planned for 2024, the Army intends to refine the systems further.

The configuration of the heaviest robot (RCV-H) is yet to be determined. It appears that it will mount a large calibre gun, so it is considered a version of the mobile protected firepower (MPF) platform currently being built for the airborne and light brigades. This platform could become an un-

manned wingman for the future M-1A2 ABRAMS tank or its replacement, known as 'decisive lethality platform'. In comparison to the ABRAMS 70-80 ton behemoth, its robotic wingman is expected to weigh 25-30 tons, carrying a similar sensor suite and firepower. The three-phase programme could reach initial operational capability by 2028.

Other unmanned platforms could be fielded sooner, fulfilling the land force's most dangerous tasks – obstacle breaching and water crossing. Today, combat engineers using assault breaching and various bridging assets, operated under a heavy smokescreen, bravely carry out those operations. These operations are often exposed to enemy fire and require extensive counterfire measures to protect the breach. In 2019, the US Army began exploring a robotic complex breach concept vehicle at the Yakima range in Washington State, and has recently asked industry to suggest transforming some of the M1150 assault breacher vehicles (AVB) into remotely controlled assets. The AVB will be able to conduct mine clearance, operate a dozer blade, lay demolition charges or extract a smoke screen in self-defence, all by remote control. The vehicle and its systems will be controlled from a distance of several hundred metres from an M-2 BRADLEY combat vehicle.

The latest combat UGV is the Type-X RCV, introduced in June 2020 by Milrem Robotics. Type-X is a 12-ton tracked chassis designed for rapid deployment and insertion into a remote combat theatre, either by parachute or airlift. A combination of augmented artificial intelligence (AI) and a remote system operator, the Type-X has armour protection that allows it to supplement troop formations or operate independently in unmanned formations. The Type-X platform was introduced with the Cockerill protected weapons station gen. II (CPWS II), mounting a 25x137mm or 30x113mm cannon.

Introducing the combination of a platform and remotely operated turret, Milrem and Cockerill have placed emphasis on convoy escort missions as a near-term primary role for such vehicles. The lead-follow functions of unmanned vehicles possess well-developed technology and by spreading some operator stations within the convoy can also provide quick response. Equipped with 25mm firepower, unmanned vehicles can provide unique advantages and options for a convoy under fire, including the ability to rush an ambush site, or manoeuvre towards the enemy's position. ■

Photo: US Army



**A Robotic Combat Vehicle (RCV) undergoing tests at a US Army proving ground**



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# The Evolving UAS Spectrum

**David Saw**

**UAS as a peripheral capability by the US military, they are now seen as essential, ranging from high altitude long-endurance strategic UAS down to Small Tactical UAS (STUAS) and even smaller systems at the lowest tactical levels.**

Usually when looking at the evolution of the modern Unmanned Air System (UAS), the starting point is given as the early 1980s. As we shall see, there is some merit in that assertion. Unfortunately, it is not strictly correct; the dawn of the UAS age happened much earlier and the operational theatre for this UAS utilisation was in Asia.

The US Air Force contracted Ryan Aeronautical (a legacy company of Northrop Grumman) to develop a strategic reconnaissance capability based on a UAS under the BIG SAFARI programme in the early 1960s. To achieve this, the BQM-34 target drone was reconfigured into the AQM-34 LIGHTNING BUG UAS and was operated by US Air Force Strategic Air Command. The first mission was flown over Southeast Asia in August 1964 and the last was flown on 30 April 1975. In total, AQM-34 UAS systems flew 3,435 missions over Southeast Asia and even into China. Primary missions were reconnaissance, ELINT and battle damage assessment. Arguably then, this was the first strategic-level UAS to enter service.

The US Air Force would retire the AQM-34 system at the end of the 1970s. These were subsequently transferred to the Israeli Air Force, with a total of 33 systems being supplied. While the AQM-34 would remain a footnote in the story of UAS evolution, its arrival in Israel would neatly connect the start of the UAS story with the next stage in its development. While Israel did have a requirement for a strategic-level UAS, hence the AQM-34, it had devoted its own resources to the development of battlefield UAS capabilities.

Israeli industry developed two UAS. Both were acquired by the Israeli military, the IAI SCOUT and the Tadiran (now Elbit Systems) MASTIFF. The MASTIFF had a system weight of 138 kg while the SCOUT system was heavier at 159 kg, but both systems had an endurance in the region of seven and a half hours and could reach an altitude of over 4,000 metres.

Others were paying attention to what Israel was doing. For example in 1979, the

Photo: Aeronautics



**The ORBITER 3 Small Tactical UAS manufactured by Aeronautics**

Republic of Singapore Air Force (RSAF) took the MASTIFF system into service and then in 1984 they went operational with the SCOUT system. What made everybody pay attention to Israel and its UAS capabilities was the June 1982 operation 'Peace for Galilee,' where Israel made an incursion into Lebanon to halt cross-border attacks. To make the operation work the Israelis had to utilise all of their reconnaissance assets, and UAS played a key role in this. They were able to give real-time data on hostile positions and movements, but most importantly, they were able to track and accurately locate the position of Syrian SAM sites in the Bekaa Valley in Lebanon allowing this air defence umbrella to be neutralised.

## UAS for all Applications

The events in Lebanon in June 1982 would act as a catalyst for UAS development around the world. Indeed, it could be said that Israeli UAS experience and technology was the starting point for the development of the UAS industry in the US and the investment of vast sums of money in that industry by the US military up to the present day. Where UAS were

once regarded as a peripheral capability by the US military, they are now regarded as essential, ranging from high altitude long-endurance strategic UAS down to Small Tactical UAS (STUAS) systems and even smaller systems at the lowest tactical levels.

In the real world UAS systems continued to prove their worth. In January 1996, Free Papua Movement (OPM) guerrillas took hostages at a World Wildlife Fund mission at Mapenduma, Irian Jaya. Negotiations began to free the hostages but in May 1996, the Indonesian government deployed their Kopassus Special Forces, under their commander Major General Prabowo Subianto (now Indonesian Minister of Defence), to free the hostages which was achieved on 15 May. One of the key assets for successfully locating the hostages in very difficult terrain was a Singaporean IAI SCOUT UAS that had been loaned by the RSAF. Successful UAS utilisation would see increased acquisition in Asia, either via foreign suppliers or by the development of indigenous UAS manufacturing.

More than two decades on, the proliferation of UAS capabilities and the expansion of their scope has become enormous.



Photo: US Army

**US troops prepare an RQ-11 RAVEN for launch during a joint company-level exercise in Thumrait, Oman. The RAVEN is a 'rucksack portable,' tactical UAS with a weight of 1.9 kg and an endurance of 60 to 90 minutes. It is one of the most widely deployed tactical UAS.**

UAS have moved beyond the military into law enforcement and beyond that into a host of commercial applications that require surveillance capabilities. More than that, they have moved into new territories: a basic UAS and a camera payload are easy to acquire and are affordable for the general public. It would appear

that now anybody can have a surveillance capability. More and more western militaries have come to depend on the advantages that UAS give them. This has been especially true of operations in Iraq and Afghanistan. But others have now caught up, for example Iranian use of UAS in attack missions

against Saudi Arabia from 2019 onwards, and more recently the use of armed UAS systems by Turkey in Libya and in support of Azerbaijan.

For many though it was the extensive use of UAS capabilities by Russia against Ukraine from 2014 onwards that was a major surprise, aggressive and widespread use of UAS across the battle area. In Ukraine, Russian Battalion Tactical Groups (BTG) deployed UAS forward at different altitudes with different sensors scanning the area of interest, data was passed back to the BTG who could use their organic artillery to rapidly neutralise identified targets allowing the advance to move forward. At a less complex level, we currently see the widespread tactical employment of UAS by both Azerbaijan and Armenia to identify troops in the open and to call down fire.

Very rarely can a system claim to revolutionise modern warfare, but in this case it would be fair to credit the UAS with a major contribution to revolution. As to the future, from the lowest tactical up to highest strategic level the UAS is and will remain ubiquitous. ■

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# First Aid Training and Simulation

**Alex Horobets**

In the world of today's military operations, saving soldiers' lives and safeguarding their overall health remain top priorities. Even with high-technology weapons and modern armoured vehicles, it is impossible to avoid various types of injuries. In more than 80% of cases, the main causes of death are massive blood loss and shock. Such types of injuries sustained in armed conflict limits the time for administering emergency medical assistance on the battlefield.

About 90% of deaths on the battlefield are sustained before the wounded person can be taken to a medical institution, because there are between just a few seconds to one hour to save the wounded person. If the wounds are not assessed as critical, such as extensive trauma, but might be, for example, bleeding from limbs or having difficulty breathing, they can be taken care of on the battlefield. For example, most cases of bleeding from limbs can be dealt with by using a tourniquet.

Photo: BBP



*A medical aid course organised by the Ukrainian National Guard*

## The First Aid Concept

Mortality rates on the battlefield can be significantly reduced with better first aid training available to soldiers. In order to be able to provide effective practical assistance in such conditions, the necessary field first aid skills are required, which can be taught through practical trainings organised in conditions simulated to be as close to real combat scenarios as possible. The military medical doctrine prevailing in NATO forces implies that in battle conditions, the capabilities of military doctors to provide emergency first aid are significantly limited, requiring a specific plan for providing emergency assistance to wounded soldiers. Within this plan, there are several layers of medical assistance available – namely assistance carried out by the soldier himself, assistance provided by another soldier, assistance from a medical corpsman, and assistance administered by a fully trained paramedic. To do this, all soldiers are obligated to carry out compulsory basic training, which teaches techniques for providing medical care.

## First Aid on the Battlefield

The combat paramedic is especially important in this chain of assistance. Typically, one member of each tactical unit

is trained for this role. He or she will undergo specific training, in addition to practical and theoretical studies. The standard procedure in the first aid order is known as A-B-C (airway, breathing, circulation). In tactical medicine, this rule has been changed to C-A-B-C, with the first C meaning 'catastrophic haemorrhage', which must be dealt with at the very outset.

Following modern trends in tactical medicine and the training evolution for medical professionals, one should take into account the peculiarities of medical support in combat scenarios, namely, the fact that even experienced doctors can become "lost" when under fire. In such a situation, it is necessary not only to provide the emergency assistance, but also to evacuate the wounded from the battlefield. Hence, there are three different zones in which wounded soldiers are treated: the red, yellow and green zones. The red zone is the epicentre of the battle, where there is a real danger of being killed by bullets, blasts or splinters. This

greatly limits the range of assistance a medical professional can provide. In this area, the wounded person is not given complicated bandages with aid mainly consisting of tourniquet application to stop dangerous external bleeding from wounds to the limbs or neck. Furthermore, the wounded person is quickly examined from head to toe in order to identify possible bullet wounds or fractures. If necessary, cardiopulmonary reanimation, temporary fixing of fractures or of the spine are performed. This is followed by the fastest transportation possible to the yellow zone.

As for the yellow zone, it is understood that there are no active hostilities ongoing at that location. As a rule, this zone serves as a 'shelter', protecting troops from direct enemy fire. These can be natural or artificial shelters, such as walls of houses, or protective engineering structures. At such sheltered locations, it is possible to conduct a more thorough examination of the wounded, and to review the applied tourniquets and bandages,



after which, the injured are prepared for transportation to the green zone.

In the green zone, the work of the tactical medical specialists is over. Wounded soldiers are then handed over to doctors working at field hospitals.

## Types of Wounds in Combat Conditions

It is paramount that immediate first aid is carried out in the first minutes after being injured as all procedures performed during this time are the most critical for survival. And it really is just a matter of minutes. If there is haemorrhaging from the main femoral and brachial arteries, the wounded can die within just two minutes from rapid blood loss. With injuries involving bleeding from the carotid artery in the neck, rapid blood loss, air absorption into larger veins or vascular blockages, death can also occur within two minutes. With haemorrhaging from head vessels, death can occur any time between several minutes to one hour. In the case of head injuries, obstruction of the upper airways may occur as a result of swallowing the tongue; in such a condition, the wounded soldier will die within five minutes if left lying on their back.

With a sudden cardiac arrest caused by a shockwave from a blast for example, or a closed chest injury, death will occur within five minutes. A chest penetration injury causes death within 10 minutes to one hour. It can therefore be seen from this list of common injuries and injuries received under combat conditions, that the paramedic or trained soldier has from just a few minutes to one hour to provide the necessary first aid to wounded troops. With the correct course of action and if the person does not 'lose control', the injured soldier will stand a chance of surviving before being transported to a field hospital.

## The US Experience in Tactical Medicine

When looking at countries that have achieved the greatest advances in tactical medicine, and have set the trends in the further development of this field, we should mention the United States and Israel. The US Armed Forces have many years of experience from the conflicts in Iraq, Afghanistan and other theatres. US troops have had to cope with battlefield injuries in challenging geographic conditions for years. According to official information from the Pentagon, since the beginning of military operations in Iraq up until 2019, the US lost 7,028 troops

and suffered more than 50,000 injured personnel. The progress made in the techniques and provision of medical assistance on the battlefield have been very costly. However, the system of care now in place has achieved high rates of survival following injuries sustained and one of the lowest rates of traumatism. In particular, it is worth noting the ability of the US Army to successfully transport its wounded by air in order to ensure the necessary medical assistance in field hospitals.



Photo: Patriot Defence

### A training course for military paramedics in Ukraine

Moreover, since the war in Iraq, and the participation of American soldiers in a range of other military operations across the globe, the country has significantly increased the number of research organisations and institutions engaged in the development of modern forms and techniques in military medicine.

One example is the American College of Surgeons which has established collaboration and implemented an exchange of experience between the military medical branch and civilian professionals. Such cooperation enables military surgeons to constantly maintain their skills at the required level, not only in wartime, but also in peacetime.

The idea of training military doctors in civilian hospitals appeared more than 20 years ago, raised by doctors who had worked with injured troops during the First Gulf War. In 2015, the American international broadcaster Voice of America prepared a report about the training of military medical personnel before their deployment to combat zones. According to a study carried out by the University of California at Davis, emergency medical centres provide the best environment

for training military doctors and nurses scheduled for overseas deployment in conflict hot spots. The specifics of these medical centres is that they are optimised to treat the severest of injuries. Working in these departments is arguably one of the most difficult and stressful places in any hospital. The value for military medical practitioners in such institutions is that they learn to react very quickly, to operate in any given situation and without additional preparation time.

For example, the emergency department at the University of Southern California in Los Angeles trains US Navy medics. About 20 patients with various kinds of injuries are admitted to this department on a daily basis, involving stabbings, gunshot wounds, car crash injuries, etc. Such training in accident and emergency procedures is vital for military doctors, since they are able to deal with real bullet wounds and similar injuries, which is obviously significantly different to training on dummies. As a result, this practice allows the physicians to become mentally prepared for future work, to work with procedures designed to provide emergency care in difficult conditions, and also to learn how to think and react promptly. This practice reduces the 'adrenaline shock' and allows doctors to learn how to remain focused in stressful situations, such as in combat scenarios.

## The TCCC Protocol

Tactical Combat Casualty Care (TCCC) is the most common protocol in tactical medicine. According to available statistics, those armed forces with their train-

ing systems implemented in accordance with TCCC recommendations, have a high-quality system for providing medical and evacuation assistance during combat operations. This refers to NATO countries and their allies. Accordingly, actions taken in line with these recommendations result in the highest survivability rates for wounded soldiers.

During TCCC courses, students are provided with a variety of educational materials such as tourniquets, bandages, dummies, and other equipment for practical skills training. The assessment of knowledge and skills is carried out by means of a practical test and successful comple-

which, in addition to areas listed in the TCCC-AC protocol, also includes the procedure for pleural drainage, working with burns, blood transfusion, pain relief, splinting of injured limbs, and a number of other complex emergency procedures. An integral part of tactical medicine is the need to rescue the wounded under fire. Therefore, the TCCC protocols also include such training. Taking into consideration the different conditions present during armed conflict situations, more than one course of action has been worked out. The servicemen/women and military medics should be able to return fire in response, move to shelter, try to

conflicts add to the already stressful situations. Therefore, the logical development of the first aid training industry is accident simulation, which develops the concept of scenario learning by introducing visual challenges.

This type of training is becoming increasingly popular even with business professionals, when these types of courses are ordered for their staff. During the courses, they learn how to properly locate injuries that may not be obvious, how to visually assess the severity of the injury, provide necessary assistance, evaluate the effectiveness of actions after the provision of assistance, and to see how blood and other body fluids spread.

The main point of "Real First Aid" is to simulate an accident according to a specific scenario. The simulation of different situations makes it possible to observe the reaction of military doctors or soldiers in administering first aid. To do this, a realistic armed conflict or other situation that may arise on the battlefield is simulated either indoors or in the open. Actors are involved in these simulations for a more credible learning experience. Real emergency equipment, emergency sirens and pyrotechnics, fake wounds and blood are all used. In an integrated way, such simulation training allows the checking of real response times of military doctors or soldiers, in conditions that are as close to reality as possible.

The 'Combat Medic' programme developed by the research company, Applied Research Associates (ARA) is also worth mentioning. The software employed takes users to a '3D world' where they are trained to deal with the three most common battlefield cases – haemorrhaging, airway blockage, and lung collapse (pneumothorax). The programme's software enables the simulation of behaviour of a living organism and shows how the actions of doctors affect the patient. It is also possible to practice not only virtually, but also on high-tech mannequins. For instance, when external cardiac massage or artificial respiration are performed, sensors in the dummy track the pressure and speed applied. After processing the data, a model of what happens to the blood pressure and respiration is created in order to understand the accuracy of the medic's actions.

### Ukrainian Experience

With regard to the teaching of tactical medicine, the Ukrainian experience should also be studied. Ukraine began to introduce the rules and methods for



Photo Credit: US Army

**A US Army emergency paramedic provides enroute care to a casualty during a Combat Casualty Care Tactical exercise.**

tion of a simulation scenario, when the skills needed for assisting the wounded are put into practice. The essence of the TCCC course is to teach strategies aimed at providing the most optimal care for injuries received on the battlefield. The TCCC-AC course is also known as the US Army Rescue Fighter Course, designed for armed forces personnel without medical training; it includes training modules covering first aid skills while under fire, stopping life-threatening bleeding, maintaining the patency of airways, treating pneumothorax conditions, controlling bleeding, and conducting tactical evacuations. These courses are suitable for soldiers, sailors, the Marine Corps and Air Force personnel.

The TCCC-MR course covers tactical assistance to the wounded person on the battlefield and is primarily aimed at medical personnel with key recipients being military medics, Marine medics and paratroopers. This is an extended course,

prevent new wounds, and if the wound is not assessed as critical, give instructions to the injured to continue the fight; also to assist victims in extricating from burning vehicles or buildings, and to stop life-threatening bleeding.

Even if there are only three centres for the training of military doctors and nurses in the United States, where they can observe the work of the emergency department, the demand for this kind of training is far higher.

### Casualty Simulation

As mentioned above, there is a constant need for practical training for military medical personnel, but it is difficult to distribute everyone to civilian emergency centres. Moreover, many personnel previously trained to provide first aid are often unable to properly perform in their response to the life-threatening emergencies. The conditions prevailing in armed

providing first pre-medical aid to Ukrainian soldiers in 2014, taking as its basis the experience of the US military. The programme has since been improved, based on the practice of the Ukrainian military in conducting the anti-terrorist operation in the east of the country.

The first clashes involving the Ukrainian military with the armed separatists and Russian units in Donetsk and Luhansk regions revealed just how unprepared the Ukrainian Armed Forces were in ensuring the survival of their military personnel wounded in combat operations. The mortality rate of injured troops was significantly higher than in the armies of NATO countries, which is 3%. Therefore, since 2014, the Army began to establish the procedures for providing first aid to the injured, and the logistics of further medical care in military hospitals. Volunteer organisations and foreign experts contributed greatly to trainings according to NATO standards, which significantly increased the readiness of the Armed Forces of Ukraine to provide pre-medical assistance. For example, teachers of the Department of Disaster Medicine and Military Medicine at Vinnytsia National Medical University have been study-

ing tactical medicine for several years, analysing current NATO standards, such as Tactical Combat Casualty Care, and implementing this into their own educational programmes.

It is worth looking at the Ukrainian public figure, Dr. Ulyana Suprun, who in 2014, headed the humanitarian initiatives of the World Congress of Ukrainians, and subsequently founded the Patriot Defence public organisation, which trained Ukrainian soldiers according to the international standards of tactical medicine. When the Patriot Defence organisation was founded, its primary task was to provide the Ukrainian soldiers with the Combat Lifesaver Course and improved individual first aid kits. Soon, their activity was expanded to the training of sanitary instructors in the "Special Forces Medic" course and the training of other rescue services in the "First on the Scene" course.

Dr. Suprun pays particular attention to the conditions faced by the country's military. Notably, on the front line, troops need training and specialist equipment to stop bleeding, maintain airway patency, and how to treat pneumothorax. After that, the wounded person needs to be

transported to a medical facility to be provided with the necessary qualified assistance. Furthermore, traditional white medical vehicles with bright red crosses can become targets for the terrorists' artillery and snipers. Such vehicles are far better employed away from the actual hostilities, for transporting injured troops from the field hospitals to larger medical facilities located in cities. Evacuation vehicles deployed on the front line need to be armoured and equipped with the necessary equipment to provide assistance. As the American and Ukrainian experiences illustrate, the introduction of tactical medicine courses and the development of methods for providing pre-medical care is the key to saving the lives of soldiers wounded in combat. The theoretical training needs to be combined with the practical training of how to use the modern tactical first aid kit, to provide pre-medical assistance in fire zones and in shelters, as well as methods of evacuating the injured. A new level in tactical medicine is the simulation of accidents and the use of high-tech dummies, which brings trainees as close to a real combat situation as possible, and enhances their readiness to provide the necessary assistance in stressful situations. ■



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# International Corvette and Frigate Programme Outlook

**Bob Nugent**

**Corvettes and frigates are important ships in today's naval fleet structures, and both types also have a long and colourful operational history, tracing their lineage to the days of sail.**

Reflecting that heritage, both the frigate and corvette occupy specific roles and mission places in their navies and are seeing significant resource commitments over the coming two decades. The number of frigate and corvette programmes currently building or forecast to be built testify to the continuing operational relevance of the two ship types.

## Introduction

This article surveys the outlook for corvette and frigate programs around the world, drawing on the detailed naval technical and market data collected and analysed by global naval market firm AMI International. The article begins with an assessment and comparison of the aggregate market for

- A medium-sized surface combatant (between 2,000 and 5,000 tons) that is either suited for one specific role (anti-submarine warfare or anti-air warfare) or has lesser all-around capabilities than a destroyer. A frigate may be less capable than a destroyer, however, is still a relatively sophisticated and expensive (averaging around US\$400M per hull) platform. A frigate is generally the smallest surface combatant that can conduct extended blue-water missions in a high-threat environment.

Corvettes are defined as:

- Fast (around 25 knots or better), well-armed ships that displace between 700 and 2000 tons. A corvette is generally not intended for extended ocean-going operations and is best suited for regional operations. Corvettes are generally the smallest platforms capable of accommodating the sensors, weapons, and combat systems needed to operate in a medium threat environment. Corvettes are sometimes referred to as light frigates (FFLs). It can be assumed that the hull design for a corvette and that of an offshore patrol vessel are very similar. The differences will be in propulsion and outfitting. Corvettes will have higher speed and therefore less endurance and range than OPV, much greater armament, and less space for provisions and habitability.

These definitions are not exclusive or exhaustive but are used as general guidance for classifying ship programmes by type. As will be shown below, the definition of frigate is somewhat fluid, and can include ship designs as large as 8,000 tons. Here classification conventions specific to countries and budgetary politics both play a role in determining how a ship is classified. In some settings, frigates are preferred to destroyers as “brands” conveying more general-purpose usage (and perhaps less “warlike” images). Frigates also convey a sense of a ship that is smaller than a destroyer, and therefore less costly, which may be a factor in getting budgets submitted

Photo: AMI



*Qatar's DOHA class frigate*

## Author

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the two ship types. It next examines frigate and corvette acquisition programmes by regions, highlighting the trends and differences for both types in different parts of the world. Statistical analyses of AMI data reinforce some of the top-level observations for AMI's aggregate market segment data. It concludes with some observations about the future prospects for both ship types.

## Ship Types and Definitions

AMI defines ship types consistent with current practices used by classification societies. A Frigate is defined as:

## Underwater Systems for Mine Ordnance Disposal

Underwater vehicles are used for scientific, industrial and military purposes. Numerous naval forces, as well as law enforcement agencies, have recently upgraded and retrofitted their equipment in this regard. A look at the Netherlands shows the increasing importance of underwater systems.

### Christian Trottman

Until today, for example, sea mines dating from the Second World War are still regularly found in the North Sea. These are detected and later neutralised by naval mine divers – a costly and often dangerous operation. This work can be done more efficiently and without risk by unmanned underwater systems. Ultimately, operational safety is perhaps one of the most important advantages of using such robotic systems. According to Heinz Schulte, member of the board of the German Maritime Institute in Bonn (Germany), underwater is gaining international importance in all conceivable conflict scenarios – symmetrical and asymmetric. All dimensions of the underwater cluster, namely submarines, torpedoes, naval mines, sonar and ROVs (Remotely Operated Vehicle) are part of future military and asymmetric operations.



Photo: Saab

### The Netherlands as European Pioneer

Not the least because of this development, the Netherlands became the first European country to select for Saab's Sea Wasp underwater robot system in April this year. Big ports like Rotterdam and Amsterdam are exposed to risks of terrorist attacks. Jan Terlouw, Country Manager at Saab Netherlands adds: "If Rotterdam were to be closed for only 24 hours, this would already have a massive economic impact on North-Western Europe. Furthermore, due to the size and complexity of the port it is relatively vulnerable". Starting next spring, the first Dutch crews and operators will be trained on the new underwater system Sea Wasp. Within two to four days, man and machine will be ready for action.

Five years ago, the US Combat Terrorism Technical Support Organisation (CTTSO) decided to develop a water-based disposal system for improvised explosive devices (IEDs) together with the Swedish company Saab. The three underwater

systems are currently operated by the US Navy in Norfolk (VA), the FBI in Los Angeles (CA) and the law enforcement agency in Charleston (SC).

### Defending Shores with Flexibility

Sea Wasp has been designed as a fully mobile underwater system that can be operated either in ports, lakes, rivers or other waterways. Orientation is achieved by camera and sonar. The operating range varies and depends on the integrated sonar, with a maximum range of 100 metres. The operator is connected to the ROV by a 160-metre electrical/optical cable for power and communication. With a speed of just over 2.5 knots and a basic weight of 75 kilograms, the underwater vehicle navigates to the pre-defined location using waypoints in a chart interface. Obstacles under water are automatically detected and avoided. The six degrees of freedom allow for manoeuvring and operating under water with maximum freedom of

movement. Experience has shown that Sea Wasp can reliably locate, identify and neutralise explosive devices even in confined spaces and under difficult conditions such as strong currents.

### Wide Range of Operations

The Sea Wasp is appropriate not only for military operations by all Naval Forces, but also for law enforcement agencies for anti-IED and other missions during underwater operations. Jan Terlouw says: "Due to its small dimensions and footprint, its manoeuvrability and relatively low weight, Sea Wasp is perfectly suited for counter IED operations in ports and also for possible self-defence of the own ship". Such unconventional explosive devices are usually well camouflaged and difficult to detect. In short: Underwater systems contribute to the general safety in ports, support ship inspections and the elimination of IEDs or even prevention of terrorist attacks.

Read more: [saab.com](http://saab.com).



Photo: AMI

**The US Navy’s newest frigate known as FFG(X)**

and approved for those ship programmes. Along these lines, AMI classifies as destroyers programmes in several countries that use “frigate” in their title, among them: Brazil, Germany (MKS 180 (F 126 SAXONY), Italy (BERGAMINI class frigate (NGF), Netherlands (M Class Replacement), Turkey (TF 2000). These programmes are not included in the frigate and corvette segment data below.

**Global Forecasts and Trends**

AMI summarizes aggregate projects and market value by segment. The summary below shows that the number of programmes, ships and acquisition costs for the frigate segment is about four times as large as that for corvettes worldwide, as measured by number of hulls forecasted to be acquired over the next 20 years (301 compared to 76). There are three times as many frigate programmes (53 to 18) and over 10 times the aggregate acquisition costs for frigates (US\$14.7Bn) compared to corvettes.

Several factors explain why frigates represent so much larger a share of the global naval market compared to corvettes. First, a significantly greater number of the countries in the world operating navies are acquiring frigates compared to corvettes. AMI’s database on the 53 new construction frigate programs show that they are being pursued by 42 different countries. For many of these countries, the frigate represents their Navies’ primary surface ship and main new construction naval programme, reflecting the “frigate as flagship” phenomenon that demonstrates the path to maturation and growth of many fleets beyond coastal and regional maritime security. In some cases, ships of size (below 3,000 tons) and design (optimised for single missions) that might justify their classification as a corvette are termed frigates to signal just this intent by their navies to emerge from a “coastal” fleet to one better equipped for regional missions. Few countries are credited with more than one frigate programme. Among

the 54 projects in AMI’s database, only six countries are acquiring or forecasted to acquire more than one class of frigate: India, Indonesia, Russia, Saudi Arabia, South Korea and the United States (in this last case, both classes of LCS and the recently awarded Future Guided Missile Frigate – FFG(X – are classified as frigates).

Second, many frigate programmes are responding to shifting threat environments which are driving navies to acquire platforms capable of handling more, and more lethal, threats. The growth in submarine procurements worldwide and the proliferation of increasingly capable anti-ship missiles are generating requirements for ships of frigate size to deal with these threats. While corvettes can and do contribute to the anti-submarine and anti-missile/air defence missions of their navies, the smaller size and more limited systems typical of corvettes makes them a less robust response to the contemporary threat environment.

Only 17 countries are acquiring corvettes, and only 1 (Israel) is credited with more than one programme. Among the countries with corvette programmes, many operate in confined waters and/or face significant naval budget constraints (Turkmenistan, Montenegro, Iraq, Bangladesh as examples). For others such as Russia, Poland, Germany, and Taiwan, the corvette is designed to address a single mission primarily (usually ASW) and is intended to operate in concert with other fleet and service elements in a layered concept of operations.

AMI provides detailed data on all the individual programmes making up the frigate and corvette segments. This data supports some top-level statistical assessments that help further understand each segment, as well as the differences between them. Table 3 presents some descriptive statistics that characterise the two segments and highlight some structural differences between the two:

**20 Year Forecast: Frigates**

| Total Number of Projects | In Progress | Planned | Total Value | Total Build 2020 to 2039 |
|--------------------------|-------------|---------|-------------|--------------------------|
| 18                       | 9           | 8       | 14,377.70   | 76                       |

**Table 1**

**20 Year Forecast: Corvettes**

| Total Number of Projects | In Progress | Planned | Total Value | Total Build 2020 to 2039 |
|--------------------------|-------------|---------|-------------|--------------------------|
| 53                       | 30          | 19      | 154,635.00  | 301                      |

**Table 2**

|                             | FRIGATE                    |                                    |                              | CORVETTE |                                      |                              |
|-----------------------------|----------------------------|------------------------------------|------------------------------|----------|--------------------------------------|------------------------------|
|                             | Ship size (tons full load) | Total Program Value (US\$ million) | Number of Ships in Programme | Ship FLD | Total Programme Value (US\$ million) | Number of Ships in Programme |
| <b>Average</b>              | 3723.3                     | 2917.6                             | 5.7                          | 1511.89  | 798.76                               | 4.22                         |
| <b>Correlation</b>          |                            |                                    |                              |          |                                      |                              |
| Ship Size & Programme Value | 0.48                       |                                    |                              | 0.20     |                                      |                              |

**Table 3**

Two broad level observations come out of this segment analysis. First, and not surprising given the difference in missions between the two ship types, frigates on average are more than double the size of corvettes – about 3,700 tons FLD compared to about 1500 tons. Second, there is considerable variation in both segments in two measurements – ship size, and total program value. As noted above, the size of frigates varies more widely – from 2,200 tons to 8,800 tons – while projected corvettes fall in a narrower range of 700 to 2,000 tons.

Along the same lines, total programme value (aggregate acquisition cost) for the two segments also vary widely, with the average for frigate programmes being about US\$3Bn, and for corvettes close to US\$800M. Frigate programmes also tend to be larger (averaging close to 6 ships per programme). Corvette programmes, somewhat counter-intuitively for the less expensive ship type, are smaller in scope on average at average about 4 hulls per programme.

A quick analysis of the correlation between ship size and programme value shows it to be positive for both segments. This is to be expected, since larger combatants are equipped with more sensors, weapons and other systems that push up cost. The greater correlation between ship size and programme value for frigates – at .48 more than double that of corvettes – further reinforces the market reality that the larger the combatant, the more, and more expensive systems are found aboard it.

These statistics also reinforce the difference in missions between the two ship types –corvettes tending to be equipped for one or perhaps two missions, while frigates are more likely to be equipped to perform evenly in all domains—anti sub, anti-surface and anti-air.

### Regional Analysis – Frigates

Next, we consider the outlook for frigate and corvette programmes on a regional basis. A listing of regional shares of the

Photo: BAE Systems



**BAE Systems` HUNTER class frigate**

|                                      | Regional Share – Value | Regional Share – Hull Count |
|--------------------------------------|------------------------|-----------------------------|
| <b>US</b>                            | 19.45%                 | 11.96%                      |
| <b>Caribbean &amp; Latin America</b> | 6.29%                  | 7.97%                       |
| <b>Europe (NATO and non- NATO)</b>   | 16.59%                 | 14.95%                      |
| <b>MENA</b>                          | 14.02%                 | 12.29%                      |
| <b>Russia</b>                        | 7.46%                  | 9.30%                       |
| <b>Asia &amp; Australia</b>          | 36.19%                 | 43.52%                      |
| <b>Total</b>                         | 100.00%                | 100.00%                     |

**Table 4**

global frigate market measured by both programme value and number of hulls is shown in Table 4.

The Asia Pacific region leads the world in both the amount of resources being invested in frigate programmes, at 36% of the world total, and the number of new frigate hulls being built – 43.5%. While this weighting partly reflects the greater number of countries grouped in the region by AMI (22), it also shows how the region’s economic performance and regional tensions are combining to spur greater spend-

ing on frigate. In Europe, where NATO members and non-NATO nations add up to 33 countries in total, the comparative spending and build rates on frigate programmes are significantly less, as 15-16% of global totals in both categories. Outside of the Asia-Pacific region and the US, most of the regions show a consistent pattern of programme value shares and hull count shares being within 1-2 percentage points of each other. The larger share of US spending compared to the number of hulls being acquired is due to the scope and relatively

expensive per hull cost of the future frigate program (FFG(X), with 20 new hulls in the program expected to come in at close to US\$1Bn in average per hull total cost. Table 5 provides further statistical insights into regional differences in frigate programme

the rest of the world is executing frigate construction in classes of about four ships each. The higher number of Type 057 frigates forecasted to be built by China (30) pushes the numbers in the Asia/Australia region up to close to seven ships per class on average.

As noted above, China’s 30 hull Type 057 programme explains this higher number, as do the 12 hull Malaysian Maharaja Lela Class, 8 hull Japanese 30ff (high speed frigate) programme, and 7-hull projects in Australia (Hunter) and India (Nilgiri/Stealth Class Project 17A).

| Region                      | Average Ship Size (tons FLD) | Regional Variation in Ship Size (CV) | Average Program Value 9SUD millions) | Regional Variation in Value (CV) | Average Programme Size (# ships) | Regional Variation in Average Programme Size (CV) |
|-----------------------------|------------------------------|--------------------------------------|--------------------------------------|----------------------------------|----------------------------------|---|
| US                          | 4459.67                      | 0.59                                 | 10026.67                             | 0.86                             | 12.00                            | 0.58  |
| Caribbean & Latin America   | 3188.33                      | 0.23                                 | 1621.67                              | 0.39                             | 4.00                             | 0.32  |
| Europe (NATO and non- NATO) | 3953.46                      | 0.35                                 | 1973.23                              | 0.71                             | 3.46                             | 0.38  |
| MENA                        | 3099.78                      | 0.25                                 | 2408.33                              | 0.59                             | 4.11                             | 0.28  |
| Russia                      | 4133.33                      | 0.15                                 | 3846.67                              | 0.44                             | 9.33                             | 0.54  |
| Asia & Australia            | 3849.21                      | 0.46                                 | 2945.16                              | 0.89                             | 6.89                             | 0.95  |

Table 5

This data shows that the global average for frigate size is close to 3,800 tons. Regional average frigate sizes vary from 3200 tons (Latin America-Caribbean) to over 4,000 tons (US and Russia). The higher values reflect the outlier effect of two large frigate programs: the FFG(X) in the US at 7,500 tons and the ADMIRAL GORSHKOV class (Project 22350), and MERCURY class Frigates (Project 20386) at 5,000 tons and 4,600 tons FLD respectively. Most of the frigate programmes in Europe and the Asia-Pacific region are below 4,000 tons, while South America and the MENA region concentrate on smaller designs closer to 3,000 tons, reflecting both operational and budget environments supporting smaller frigate designs.

The significantly higher average program cost of the US, frigates also highlights the disproportionate impact of the FFG(X), which at about US\$1Bn per hull is by far the most expensive frigate being built or planned for construction worldwide. Again, large displacement frigate programmes in Russia also explain their higher average programme cost. Most other regional frigate programmes come in at between US\$1.5Bn and US\$3.0Bn.

The third measure of regional frigate programs is average number of hulls per programme, with the 20 hull FFG(X) programme and two Russian programmes planned for 10-15 hulls per class skewing those region’s numbers upward. Most of

The Coefficient of Variation (CV) is a statistical indicator that allows comparisons of variability across the three disparate measures by comparing the ratio of standard deviation and means for different measures. Ship size CV is highest in the US (FFG(X) effect), followed by the Asia-Pacific region, where Australia’s HUNTER class (SEA 5000) programme building ships of over 8,000 tons sets the mark as the region’s largest frigate design. At the other end of the scale, Bangladesh and Vietnam are both projected to acquire 2,100-ton frigates (Chinese origin Jiangkai II/Type 054A and Russian origin GEPARD/Project 11661 respectively) that are closer to corvettes in design.

Average programme value CV is highest in the US and Asia-Pacific regions, with the FFG(X) and the Australian HUNTER class (at an estimated US\$800M per hull) accounting for the high scores. The Asia/Australia region also includes programmes costing over US\$5Bn each in India, Malaysia and China, further accounting for the region’s “top end.” Europe also shows considerable variation in programme values, with the French FTI, and Greek Belharra (French origin) programmes estimated to cost about US\$4Bn each representing higher value programs amidst the majority of European frigate programmes costing US\$1-2Bn.

The variation in numbers of ships per programme is lower (CVs between .28 and .58), in most regions of the world with the notable exception of Asia/Australia.

### Regional Analysis – Corvettes

The picture of the corvette segment is simpler, reflecting the fewer number of ships and programmes in the segment. In contrast to frigates, only four regions are committing to new corvette construction, and of those Russia is represented by a single programme. Still the data does yield some insights into regional patterns.

|                             | Regional Share – Value | Regional Share – Hull Count |
|-----------------------------|------------------------|-----------------------------|
| Europe (NATO and non- NATO) | 34.92%                 | 19.74%                      |
| MENA                        | 27.65%                 | 27.63%                      |
| Russia                      | 9.74%                  | 5.26%                       |
| Asia & Australia            | 27.70%                 | 47.37%                      |
| Total                       | 100.00%                | 100.00%                     |

Table 6

First, as shown in Table 6, the regional distribution of new corvette building, as measured by the number of new hulls, is again concentrated in the Asia & Australia region. Most of this difference in regional hull counts is explained by China’s JIANG-DAO (Type 056) class which, at 13 hulls is the largest corvette construction programme in the world. Taiwan’s estimated procurement of 11 TUO JIANG/MIN JIANG



corvettes also contributes significantly to the region's nearly 50% share of all new corvettes expected to be built worldwide through 2040.

The distribution of planned spending on new corvettes is more even across Europe, the Mid East and North Africa (MENA) and the Asia and Australia region, with each making up about a third of the US\$14.3Bn expected to be spent on the ship type in the coming two decades. This pattern is based on the relatively higher cost of corvettes in Europe. Germany's Batch II of the K130 class corvette is assessed to be the most expensive corvette program worldwide, representing about 15% of total global spending forecasted for the segment. Other more expensive corvette programs are found in the MENA region, where Israel's two classes (MAGEN (SAAR 6) and RESHEF (S 72) together comprise slightly more than 15% of total global spending on corvettes. Russia's VASILY BYKOV class (Project 22160) is also on the higher end of corvette cost, at just over US\$350M per hull.

Photo: MoD Russia



**The Russian BYKOV class corvette DIMITRII ROGACHEV**

| Region                      | Average Ship Size (tons FLD) | Regional Variation in Size (CV) | Average Programme Value | Regional Variation in Value (CV) | Average Programme Size (# ships) | Regional Variation in Average Programme Size (CV) |
|-----------------------------|------------------------------|---------------------------------|-------------------------|----------------------------------|----------------------------------|---|
| Europe (NATO and non- NATO) | 1792.40                      | 0.05                            | 1004.12                 | 0.73                             | 3.00                             | 0.47  |
| MENA                        | 1386.67                      | 0.21                            | 662.50                  | 0.66                             | 3.50                             | 0.43  |
| Russia                      | 1300.00                      | 0.00                            | 1400.00                 | 0.00                             | 4.00                             | 0.00  |
| Asia & Australia            | 1438.67                      | 0.32                            | 663.68                  | 0.61                             | 6.00                             | 0.80  |

**Table 7**

Table 7 provides further insights into regional corvette programmes. The first observation is that corvette designs worldwide are much more consistent in size compared to the wider variety of frigate sizes. The global "average" corvette displaces about 1,500 tons at full load, with the MENA and Russian designs on average slightly smaller (1,300-1,400 tons) and those in Europe and Asia/Australia larger (1,600-1,800 tons). The latter figure is attributable to programmes in Bulgaria, Germany, Greece and Poland which range from 1,700 to 1,900 tons.

Looking at average programme value, European and Russian projects set the higher end of the range. German and Russia corvette programmes are the two most costly of the 18 projects for the type tracked by AMI. Corvettes in the MENA and the Asia/Australia regions are found at the lower end of the programme cost scale, with programs in Turkmenistan and Cambodia bringing regional average cost scores down.

Corvette programme scope is also much more consistent across regions compared to frigate projects. The global average of four ships is roughly matched in three of the four world regions. A notable exception is Asia-Australia, where the Chinese and Taiwanese projects (13 and 11 hulls) push regional averages higher for programme scope.

The regional CV statistic for all three programme measures again affirms the greater consistency among corvette programmes compared to frigates. Excluding Russia (whose single programme represents a "0" variability), variation in size, value and programme size are all less for corvettes compared to regional statistics for frigates. This statistical analysis bolsters the conclusion that, even given the smaller data set of 76 new corvette hulls versus 301 for frigates, corvette designs and budgets as a whole are closer to each other in size and scope, reflecting a greater consistency in requirements and missions for the segment.

## Conclusion and Outlook

The prospects for international corvette and frigate programmes over the coming decades continue to be robust, especially with regard to the latter segment. Taken together, the two types of ships represent about 17% of AMI's estimated total naval spending on all new ship and submarine types around the world over the coming two decades. While the corvette fills a role as supporting combatant in operational missions, concentrated especially in anti-submarine warfare, the frigate is clearly emerging as the surface combatant of choice for many navies evolving from local and coastal missions to more regional or even global presence. And among larger and more established naval powers, the frigate continues to be a desirable design choice for its ability to support complex combined fleet operations across many mission areas, as well as its ability to economically and effectively perform independent roles and missions. ■

# Eyes in the Sky for Boots on the Ground

## How to Renew the NATO AWACS fleet

**Bo Leimand**

In his book “Politics and Compromise, NATO and AWACS” Arnold Lee Tessmer writes that by the early 1970s, NATO had identified the Airborne Warning and Control System (AWACS) as a Priority One requirement, a designation given to few NATO military needs.

### A Priority One Requirement

Although AWACS had impressive military capabilities, it carried a high price tag – US\$75M per system and a total purchase cost of some US\$2Bn. Because no single NATO member could afford to acquire AWACS on its own, a collective purchase effort was deemed to be imperative. This article will describe the inception of this system and the current status regarding its replacement, foreseen for 2035.



*A Boeing E-3A SENTRY airborne over Italy*

Photos/Graphic: NATO



### The AWACS

In 1978, NATO jointly acquired an airborne early warning (AEW) capability that still exists today in a fleet of 14 NE-3A NATO AWACS aircraft. These platforms provide NATO with its “Eye in the Sky for Boots on the Ground”. The aircraft are stationed at the NATO Air Base Geilenkirchen in north-west Germany. Along with the support personnel, these aircraft make up NATO’s first integrated, multi-national flying unit, providing rapid deployment, airborne surveillance, command and control, and communication for NATO operations. The AWACS programme is supplemented with national assets from France and the United States,

and uniquely by the UK, which commits its own six E-3Ds to NATO to fulfil 25% of the force’s annual operational output. As with the Alliance Ground Surveillance (AGS), the AWACS was a tough buy for the Allied nations which desired the capability, but not the price tag. National benefits were also contested, with each NATO member rightly attempting to maximise domestic benefits from the joint programme. In many ways, the motivation, obstacles, and perceived benefits of AGS are reflected in its predecessor AWACS programme.

### The Threat

In 1970, NATO defence planners identified a problem. When flying at high speed and low altitudes, the latest generation Soviet fighters could penetrate the NATO Air Defence Ground Environment (NADGE) radar chain and strike before being detected. The rationale for AEW was accepted by European nations prior to this discovery, but the updated Soviet threat led the Allies to pursue a joint NATO AWACS acquisition with significantly more alacrity. Although the United States intended to acquire its own fleet of E-3s, then the most expensive aircraft in the world, Washington was unwilling to grant exclusive prioritisation of their use for European operations. This meant that if US AWACS were needed elsewhere, Europe might be left exposed. The reliance upon US national

capabilities for European defence created strategic problems that were not limited to AEW, but unlike the nuclear issue, aerial reconnaissance was not accompanied by political controversy (save its expense), so it was a capability that the Allies could jointly pursue. This did not mean though that its acquisition was an easy task.

### Political Compromises

A major stumbling block to the joint acquisition of NATO AWACS was the division of national benefits. This was a problem because the E-3 was almost entirely built by Boeing in the United States, by American workers. In the true spirit of jointness, however, each participating NATO nation expected to receive a share of spending inside its country commensurate with its costs. The European Allies desired more European industry involvement in the AWACS acquisition, but fiscal and technological constraints made such a move impractical. Because many European Allies did not wish to increase their reliance upon the United States by committing to long-term procurement contracts that bolstered United States industry at European expense, the Allies reached an impasse. However, in his book, Mr. Tessmer explained that there would have been no AWACS programme without a political compromise, most of which worked so well that few can remember the details, much



**A Boeing E-3 NATO-AWACS with three USAF F-16 FIGHTING FALCON**

less the stir they created when governments first proposed them. The same might be said about AGS in a few years' time.

## AWACS Operations

NATO AWACS has been engaged in various operations over the years. Two of the most important examples from the operational logbook should be mentioned as they had some interesting impacts on the AWACS programme.

### Operation Afghan Assist

Following a July 2008 request for assistance and delayed by lengthy debates about costs and usefulness, NATO AWACS resumed their combat role on 15 January 2011 under the banner of Operation Afghan Assist. Because the aircraft were based at Mazar-e Sharif, Afghanistan, this operation was the first in which NATO nations operated their AEW system outside of NATO territory. The lengthy debates might have had the indirect consequence that Canada opted out of the programme in 2011 after carrying out a Strategic Review. Note: Canada rejoined the NATO AWACS programme in 2018.

### Operation Unified Protector

Soon after NATO assumed this new role in supporting ISAF, discord regarding the conflict in Libya further strained the North Atlantic alliance. During the well documented row between Germany and other Allies, the AWACS programme provided Germany with legal and political manoeuvring space. Instead of directly participating in or supporting Operation Unified Protector – which might well have triggered a potentially embarrassing parliamentary vote for Chancellor Merkel – Germany shifted personnel to the AWACS mission in Afghanistan, which freed up other Allied forces for Libya. Though the Alliance managed to work through each of these conflicts satisfactorily, these more recent examples showcase how political

limitations can hinder the effective use of multi-national assets. This issue will also be mentioned at the end of the article.

## Upgrades

Since 1978, the AWACS fleet has undergone more than three major upgrades, the last one being the modernised glass cockpit. The AWACS are foreseen to be phased out from 2035 and the programme is now planning for a Final Lifetime Extension Programme for the old fleet.

### NATO Summit 2016

At the 2016 NATO Warsaw Summit, it was stated “that NATO's Airborne Early Warning and Control Force (AWACS) continues to prove itself instrumental not only to monitoring our airspace, but also as a critical part of NATO's command and control capabilities. NATO AWACS will continue to be modernised and extended in service until 2035. By 2035, the Alliance needs to have a follow-on capability to the E-3 AWACS. Based on high-level military requirements, we have decided to collectively start the process of defining options for future NATO surveillance and control capabilities.” This was the signal for renewing the AWACS fleet. Before describing how NATO, and in particular the NATO Support and Procurement Agency (NSPA) has decided to launch this programme, another important parameter needs to be addressed in this context.

### System Life Cycle Management

In 2006, NATO endorsed the use of System Life Cycle Management (SLCM) and wrote in the introduction letter that the NATO Policy for SLCM presents the principles and objectives of SLCM, how these may be implemented in NATO, and by whom. The aim is to promote the acquisition of military systems for NATO that fulfil the full range of through life requirements in a cost-effective

manner. The significance of this aim becomes apparent when it is understood that through life costs of military systems greatly exceed the initial procurement costs. This is nearly true for the AWACS as the total modernisation costs for the AWACS fleet have been almost equal to the original procurement costs.

With that in mind, it only makes sense to use the principles in SLCM and in February 2017, the North Atlantic Council (NAC) initiated the Alliance Future Surveillance and Control (AFSC) Concept Stage with NSPA as the lead NATO agency to conduct studies and develop technical concepts. Through this work, NSPA is evaluating new technologies and exploring a system of systems approach, including potential combinations of air, ground, maritime, and space systems working together to collect and share information. These studies will eventually help to formulate collective NATO decisions, those of individual Allies, or multi-national groups, to acquire new systems in the future. All 30 NATO Allies currently cooperate in the planning and resourcing of this programme. It is a tribute to the SLCM concept and the NATO Allied Committee AC/327 that a programme of this magnitude is using the principles embedded in SLCM.

### The Alliance Future Surveillance and Control Initiative

The Alliance Future Surveillance and Control (AFSC) initiative is about how NATO will continue to effectively monitor the skies over Allied territory when its current fleet of AWACS aircraft reach the end of their service life in 2035.

Through this initiative, NATO is fundamentally redefining how it will conduct surveillance, and command and control in the future. To take account of future threats and emerging technologies, NATO is currently working with experts from science, technology, industry, and the military fields to encourage innovative solutions.

AFSC is managed by a project office hosted by the NSPA located in Luxembourg and NSPA announced on its website on 5 December 2019 that it had awarded six contracts for the AFSC capability that will replace its AWACS aircraft in 2035. “This is a significant step that will enable the development of high-level technical concepts for NATO's future surveillance and control capabilities,” the agency said.

### Technical Concepts

NATO is studying a range of new technologies and different options to replace the AWACS fleet. These could include different

combinations of systems in the air, on land, at sea, in space, and also in cyber space. NATO's AFSC requirements could be met through a combination of national, multi-national, and NATO-funded solutions. NATO has agreed on high-level requirements to define what is needed from the future systems and to ensure that the Allied capabilities are able to operate as a fully integrated force. In this way, NATO is helping to formulate future decisions by the Allies for their long-term planning and acquiring new capabilities.

### Concept Development

The best value contracts are the first step in a series of concept development and assessment activities in 2020–22. At the end of March 2020, a consortia of six companies from Allied nations delivered concept studies, providing initial views on how NATO could meet the AFSC requirements by 2035. NATO is currently assessing these concepts in order to define a narrower scope for AFSC before the end of 2020. In 2021, NATO will launch a call for a second round of more detailed studies to assess the feasibility of the proposed concepts. The contracts were awarded, as mentioned above, after an international bidding process to the Boeing ABILITI Consortium, General Atomics, Lockheed Martin, Airbus Germany, L3Harris



Inside an E-3 SENTRY

Consortium UK, and MDA under the NATO Security Investment Programme (NSIP) infrastructure programme. The Boeing ABILITI Consortium includes Thales France, Leonardo Italy, Indra Systems, and Inmarsat, while the L3Harris team includes Musketeer Solutions, Videns, 3SDL, Synergeticon, Hensoldt Sensors, IBM UK, and Deloitte Belgium. This shows that the number of industries taking part in this process is an important signal to the decision makers in NATO.

Starting in 2023, NATO will analyse the proposed AFSC concept against the Alliance's inventory of capabilities to help determine where new developments may be needed. This might be a tool to integrate the inventory in the most economical way.

### Collaboration with Industry

As AFSC is building upon the principles in SLCM, it would be natural to conclude this article by highlighting one of those principles as it might set a marker for a successful programme. The principle in mind is collaboration with industry. SLCM needs a close working relationship in this field, with maximum use of civil standards where appropriate, full exploitation of new technologies and shared domain expertise to benefit from commercial best practices. To live up to this specific principle, NSPA has held three conferences to date for industry with a potential interest in the programme. Furthermore, NSPA has established a subscriber portal. The AFSC portal is an online business content management portal designed to support the AFSC community. Providing a secure means of sharing information within the AFSC community, the portal hosts a schedule of events and meetings, an electronic library, configuration control processes, and technical documentation workspaces.

### Consensus

Finally, CNAD and NIAG are briefed on the process to make sure that the NATO system is in sync, because at the end of the

day there needs to be a consensus. This has caused both the AWACS and the AGS programmes some headaches as some NATO nations struggle with two schools of thought when it comes to investing in NATO programmes. One school would like a full-blown NATO commitment, while the other school wants to invest only in national defence programmes as those assets can be used without asking NATO, since there are no international political limitations. The former US Secretary of Defence, Robert M. Gates, expressed the same sentiment, albeit differently on 10 June 2011 in Brussels, when he stated that NATO had turned into a two-tier alliance of members who consume security and those who produce it.

Gates spoke to the Security and Defence Agenda assembly the day after the conclusion of a meeting of NATO defence ministers, stating, "In the past, I've worried openly about NATO turning into a two-tiered alliance between members who specialize in 'soft' humanitarian, development, peacekeeping and talking tasks and those conducting the 'hard' combat missions -- between those willing and able to pay the price and bear the burdens of alliance commitments, and those who enjoy the benefits of NATO membership, be they security guarantees or headquarters billets, but don't want to share the risks and the costs." "This is no longer a hypothetical worry," he added. "We are there today. And it is unacceptable."

### Smooth Ride

The hope – even if not a management method – is that the replacement of AWACS will be a smooth ride with a few bumps and will live up to the following sentence which concludes Mr. Tessmer's book: "It is of these worthy people, and those who follow them, that the continued good health of the North Atlantic Alliance depends. They will all, I know, acquit themselves honorably." ■



In 2015, NATO's E-3A (NE-3A) aircraft were upgraded with glass cockpits and other advanced avionics to meet current and future Communication, Navigation, Surveillance / Air Traffic Management (CNS/ATM) airspace requirements.

# 20 Years of L-159

**Alan Warnes**

**In April 2020, the Aero L-159 celebrated its 20th anniversary serving the Czech Air Force.**

Designed as a close air support and tactical ground attack aircraft, the L-159 Advanced Light Combat Aircraft (ALCA) represents one half of the CzAF fighter force, the other half being the Saab JAS 39C/D GRIPEN. The L-159 was essentially a modern L-59 with a more powerful Garret (now Honeywell) F-124 turbofan engine. Being a single-seat cockpit meant the space where the second seat was positioned on the L-59

the L-159's crown is inevitably the Grifo L-X band multi-mode pulse Doppler radar making it the first L-39 derivative to be equipped with a military radar.

On 4 July 1997, the manufacturer Aero Vodochody received an order from the Czech MoD for 72 single-seat L-159s to replace the big fleets of MiG-23BN FLOGGERS, Su-22M4 FITTERS and Su-25 FROGFOOTS. Within a few years, it became obvious that the CzAF didn't need so many L-159s, so only 24 were initially delivered between 2000 and 2004, and the rest were put in storage after flight test.

In 2006, the Czech MoD signed a contract to convert four of the single-seat trainers to dual-seat L-159Ts with all of them being delivered on 23 November 2007. The conversion by Aero Vodochody saw two airframes being

Air training in the US and the last aircraft was delivered in June 2019.

Ten single seat L-159s and two L-159T dual seaters were sold to the Iraq Air Force on 30 June 2015 and the first four jets were handed over, including a dual-seat that remained at Aero to train Iraqi pilots in 88 days. Within a year of being acquired, the L-159s were attacking Daesh targets each loaded with two Mk82 bombs. IQAF Chief General Anwar Hamid Amin told the author in 2017, "Between June 2016 and September 2017 the L-159s dropped 859 Mk 82 bombs. They came just at the right time."

The IQAF Chief told the author he is keen to integrate a new laser designator pod (LDP) so L-159s could use laser-guided missiles without the assistance from troops on the ground.



Photos: Alan Warnes

**Aero Vodochody recently painted this L-159 with 20th anniversary marks to celebrate the delivery of the first aircraft in April 2000. It was delivered back to the Czech Air Force on 17 September 2020.**



**The first PP16 L-159 was delivered to the Czech Air Force on 16 September 2020.**

could be filled with an extra fuel tank. It meant the aircraft could carry almost 2,000 litres of fuel, while two 500lb or four 350 litre external drop tanks can also be fitted. The main differences between the L-159 and the earlier L-59 is the strengthened airframe and a cockpit reinforced with composite, ceramic ballistic protection on the sides and steel plates on the cockpit floor. The jewel of

used for each aircraft. Zdenek Zachar, L-159 Contract Manager explained to the author in mid-2018, how the aircraft were converted. "We built a new fuselage and then added the wings, nose, rear fuselage and undercarriage from one of the two aircraft. Then we added the avionics systems, ejection seats and avionics from the donor aircraft into the new cockpits of the dual-seaters."

Another two were also upgraded, each from one aircraft this time, with a new fuselage being built by Aero and ejection seats, avionics and systems that were purchased. They were both delivered in August and December 2010. By then, Aero Vodochody were carefully storing the remaining ALCAs in special protective packaging known as brenopacks.

On 29 November 2013, Florida-based Draken International purchased 14 of them, later increased to 21. Today, 17 are used for Red

The Czech Air Force increased its dual-seat capabilities with three new L-159T+s in 2019 built from the fuselages of three single-seaters, much like the last two L-159Ts. The new cockpits house a pair of 5x7 Multi-Function Displays, two new VS-20 ejection seats, NVG compatible lighting and a pressure refuelling capability with external fuel tanks. The first example flew on 2 August 2018, and by July 2019, all three had been delivered.

On 29 May 2019, Aero and the Czech MoD signed a CZK1.6Bn contract for the overhaul and modernisation of 16 L-159s known as PP16. Work on the first started almost immediately and left the Aero Vodochody facility on September 16. The contract should be completed by the end of 2022. Today the Czech Air Force has on its inventory 16 L-159s, five L-159Ts and three L-159T+ which serve 212 and 213 Squadron at Caslav Air Base. ■

## Author

**Alan Warnes** is a journalist specialising in military aviation. For 12 years, he was the Editor of AirForces Monthly. He has also written several books, including two on the Pakistan Air Force (in 2008 and 2017), and most recently on 100 years of Aero Vodochody.

# “We have more foreign aircraft to upgrade in here, than we’ve had in years!”



Photos: AERO-Vodochody

**Former Airbus manager Dieter John took over the reins at Czech AERO-Vodochody less than two years ago.**

**ESD:** What were the first steps you took upon arrival at this 100-year old aerospace company?

**John:** Yes, that is true - what an industrial tradition. However, over the years, results have been disappointing with budgets and promises not being kept. My goal therefore

**ESD:** That must have been a painful process?

**John:** Yes. It was not fun by any means. We had to lay off almost 400 employees, implement deep cuts to social benefits and pensions, and I also closed the company’s kindergarten. But the measures undertaken worked. My predecessors developed the new L-39NG, but paid little attention to MRO requirements and upgrades to the existing L-39 fleet. Today, I can say that this really is our bread-and-butter business! The previous managers had assumed that MRO requirements would die out with the old L-39s anyway.

**ESD:** Which has not happened...

**John:** No, it has not. Over 600 L-39s out of a total of 3,000 remain active worldwide. I have doubled MRO agreements and we now have more foreign aircraft to upgrade in here than we have had in years! From Uzbekistan, Kazakhstan, Ethiopia, etc. And of course we can include the overhaul of the Czech AF L-

look forward. . The M345 is a little lighter, but with the electronic software regulation, we have 16 per cent more power (16.87KN), with maximum acceleration in 3-5s, an 8G limit as opposed to the M345’s 7G. We also have 36 per cent more range, 60 per cent more payload and a freshly certified jet, all with the EU-wide accepted EMAR 21 and EMACC certification, involving 10,000 pages of documentation. Furthermore, the L-39NG offers lower life-cycle costs compared to the PC-21. And the next step will be to certify the light-combat aircraft (LCA) variant.

**ESD:** So there is demand for both variants?

**John:** Oh yes. Four advanced trainers for LOM Praha are ready for Czech Government approval. Hungary is making good progress for their 12 advanced trainers, and later on with 12 LCAs. We have received serious interest from the Slovak Defence Ministry for about 8-12 LCAs – perhaps for late 2021, or even early 2022. Several Asian customers raise strong interest, and Austria has let us know of their requirement for that a jet trainer in the mid-term, but first need an interim training solution, something which we are able to assist with in a G2G with the Czech Government and Air Force, on their eight two-seater L-159T1 aircraft and GRIFO-equipped T2s. So, all in all, it is a very positive echo from the global market place from both existing Aero customers and new ones.



**An AERO L-39NG undergoing a stress test**

was to take steps to avoid the company from becoming insolvent. And in order to begin with this task, I was given three months to present a five-year transformation plan which I called A3F [“AERO fit for future”] covering areas of general strategy, increased productivity, fewer suppliers, more international business, and a sound cost base. I presented the plan on time and it was duly approved.

159As. And I can also mention Iraq. I should also highlight that most upgrades include replacing all or parts of the avionics.

**ESD:** What are the prospects for the L-39NG – compared to Leonardo’s M345?

**John:** Over the next 15 years, 50 per cent of all jet- and prop-trainers will have to be replaced. And there are only a few competitors. We have a positive outlook as we

**ESD:** Is AERO still a supplier to Embraer’s KC-390 transport?

**John:** Indeed, and we are even the largest supplier on the KC-390, responsible for all the doors, the entire rear cargo ramp, and the wing leading edges for the Airbus A220 and all landing gears for L-410UVP fleet. We also manufacture the complete central wing box for all Leonardo C-27J SPARTANs and various smaller composite components for the A400M.

**ESD:** Thank you!

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

# Ukrainian Defence Exports

**Alex Horobets**

**At the time of the collapse of the Soviet Union, Ukraine was one of the world leaders in terms of its military potential, with thousands of armoured vehicles in its inventory. There is very little left of it. Today, Ukraine is striving to establish a modern defence industry.**

In the Soviet era, Ukraine had an army of about 800,000 men, 6,500 tanks, 7,000 armoured vehicles, 1,500 aircraft and 350 naval ships. Ukraine also boasted a powerful military-industrial complex. At that time, Ukraine accounted for almost 25% of the entire capacity of the Soviet military industry, which included more than 1,800 arms companies. While nearly 700 companies worked specifically in the military domain, the remaining companies had arms production as a secondary function, given the Soviet practice of production chains in the various republics. All these capacities had to be adapted to the new conditions, a process that took more than a year.

In view of difficulties faced in the first years of its independence, Ukraine's production of military products declined considerably between 1991 and 1995. Only about 100 military enterprises survived. Initially, it was necessary to address the collapse of former production chains with the former Soviet republics. Previously, the Ukrainian military-industrial complex was not wholly autonomous, since many components were sourced from Russia, just as Russia purchased Ukrainian components.

Given the insignificant share of state defence orders from Ukraine's Armed Forces until 2014, the Ukrainian defence industry was forced to reorient itself towards foreign markets, and it managed to achieve significant success to this end in the 1990s and 2000s. In 2013, the volume of exports stood at about US\$1.79Bn. During this period, Ukraine was one of the world's top ten arms exporters. Naturally, many defence enterprises were forced to shut down since their production was based solely on demand within the framework of the Soviet model.

For some time, the state enjoyed a monopoly in the production of military equipment, but with the foundation of the state-owned company Ukroboronprom in 2010, the management of defence enterprises became centralised.



Photo: US Air Force

***A historic image depicting a US Air Force F-16 escorting a Soviet Su-27. Ukraine has successfully positioned itself as a reliable refurbisher of Soviet and/or Russian equipment.***

Ukroboronprom united 134 enterprises with the exclusive right to export military products through special exporters.

For a considerable period, this business model was successful, especially when it came to exporting and Soviet and modernised military equipment. Indeed, as a result, a unique opportunity emerged for Ukraine to modernise and service Soviet-era equipment, including for Eastern European countries, where former Soviet units remained in service. However, this business model certainly does not exactly look towards the future, as modern-day wars require completely new approaches and solutions. In this regard, Ukraine was in urgent need of a new approach in the development of its military-industrial complex; this took place from 2014 onwards, after the severing of all military cooperation with Russia.

## Ukrainian Defence Industry Trends

Ukraine's private defence enterprises began to develop rapidly, competing

with the state monopoly. They launched supplies of military products both to the Armed Forces of Ukraine and exports to foreign customers. In 2016, a number of private defence companies united within the League of Defence Companies of Ukraine. The League's members were the first to make the transition from offering individual weapons to showcasing integral combat systems that are assembled according to a modular principle. For example, in 2017 the Ukrainian-Polish strike-reconnaissance unmanned aerial complex SOKOL made its debut. This was a combat module produced by the private Ukrainian defence firm "CheZaRa" and an unmanned aircraft developed by Poland's WB Electronics SA which had been mounted on a wheelbase made by the Polish private research and production association, "Praktika".

It should be noted that private defence enterprises in Ukraine also cooperate with the public sector, including in global arms markets. For example, a contract has been concluded by Ukraine for the modernisation of a batch of 12 Mi-24s



Photo: ISKRA

**The mobile 90K6E 3-D air surveillance radar with transistorised transmitter for low, medium and high flying target detection**

for Azerbaijan; development works have also been carried out to integrate a combat guided missile into these helicopters. Private and state enterprises independently created a complex array of guided weapons for the helicopter, with tests launched in 2018.

### Liberalisation in Military Exports

Throughout 2020, Ukraine will continue with the reform of Ukroboronprom and the accompanying liberalisation in military exports, which is shown in personnel reshuffles and also at the legislative level. In July 2020, the Verkhovna Rada, Ukraine's parliament, appointed Deputy Prime Minister Oleh Urusky as the new Minister for Strategic Industries of Ukraine. The new ministry will control the State Space Agency, the State Service for Export Control, and Ukroboronprom. The new ministry will be based on an existing department that was already part of the Ministry of Economy, with a staff of nearly 70 people; the number is set to double once the reform is completed. According to Urusky's vision, Ukroboronprom is in need of a complete transformation, including with the possible use of developments regarding changes that were drafted by the company's team. The new minister's perspective regarding change is that this should be a managing state

holding company, as well as a number of holdings engaged in armoured vehicles, precision weapons, radar systems, shipbuilding, ammunition production, and aviation. In August 2020, it was announced that the aircraft manufacturing enterprises would be withdrawn from Ukroboronprom and merged with the aerospace holding.

Photo: via author



**Ukroboronprom CEO Aivaras Abromavicius has been one of the driving forces behind reforming Ukraine's state-owned enterprised military-industrial complex.**

In fact, for the first time in Ukraine's history, a single managerial decision-making centre in the defence industry will be formed, so this is really all about the systemic implementation of government policies within the defence industry.

On 9 July 2020, a draft law on the specifics of reforming state-owned enterprises in the military-industrial complex was submitted to the Verkhovna Rada of Ukraine. Among the bill's initiators are prominent representatives of Ukraine's leading party. It was co-authored by seven top Ukroboronprom officials, including CEO Aivaras Abromavicius and his deputy Mustafa Nayyem. The reform of the state-owned defence enterprises' management is based on a document titled "The Strategy for the Development of the Military-Industrial Complex of Ukraine until 2028". The Strategy sets the following goals: restructuring the military-industrial complex, which means creating an efficient defence industry management system at all levels; meeting the needs of the Ukrainian military; and expanding export opportunities in all defence industry areas. The Strategy provides for the promotion of entrepreneurship in the defence sector, sustainable operation and development of the private sector, and the introduction of a corporate governance model for enterprises involved. In general, the Strategy is oriented toward the private sector in terms of arms production.

The reform also provides for the development of technologies, with the creation of the Agency for Advanced Defence Research Projects. In the near future, it will be clarified whether work is to be done with existing technologies, or like the American DARPA, with defence enterprises and design bureaus being tasked with searching for new technologies and creating new types of weapons.

The reform of the military-industrial complex, if implemented, could become the most ambitious move in the history of modern Ukraine, where Ukrainian producers will be allowed to export military and dual-use products themselves, without a government intermediary. In June 2020, arms exports rules have already changed. The Cabinet of Ministers cancelled the obligation of companies authorised to export military goods to coordinate export prices for military goods with the state-owned Ukroboronprom. This approach could eliminate artificial barriers and create equal conditions for foreign trade, as well as enhance the competitiveness of Ukrainian military products in the international arena.





Photo: via author

**The state-owned company Ukrspetsexport will modernise 40 Soviet-era PT-76 light amphibious tanks for the Indonesian Army.**

## The Ukrainian Export Potential

Meanwhile, exports of Ukrainian military products are also undergoing a transformation. According to the data on sales of certain types of weapons in 2019, provided by the State Service of Export Control of Ukraine, export volumes have been gradually decreasing in recent years. For example, the export figures for armoured vehicles have been down since 2014, after Ukraine suspended a number of export contracts for the supply of basic military equipment that was instead transferred to the war zone in Donbas. Deliveries under the suspended contracts resumed in 2015-2016.

On the contrary, in February 2020, Ukroboronprom CEO Abromavicius said that after several years of decline, the company's 2019 exports of arms and services increased by 19% to US\$908M, up from US\$766M in 2018. The main importers were India, Saudi Arabia, Turkey, and a number of other Asian and Middle Eastern countries. The most sought-after goods are anti-tank missile systems, and gas turbine engines and units for ships. Among services exported were repairs of Soviet-era equipment and aircraft modernisation. For 2020, the CEO of Ukroboronprom predicted an export spike by another 30%.

## The Indonesian Market

Even if Ukraine's export potential is not as massive as that of the Russian Federation, it can afford to compete with Russia on the arms markets, and even gain in

certain areas. For example, a report from June 2020 stated that the state-owned Ukrspetsexport will modernise 40 Soviet-era PT-76 light amphibious tanks for the Indonesian Army, with the prospect of modernising such tanks for those other countries operating them. The modernisation project includes the installation of a new 400 hp Cummins VT400 engine, Allison transmission, automatic loader for Cockerill Mk 3M-A2 cannons, SINTEZ aiming and weapon control system, BAZALT navigation system, and a ZASLON-L active protection system. According to Defense Express, after a trial contract for the modernisation of these 40 units, the programme could expand further to another 300 units.

Ukrspetsexport's deputy chief, Yuriy Shramko believes that this modernisation programme is an example of cooperation between Ukrainian enterprises and global manufacturers, which generally expands the presence of the Ukrainian military-industrial complex on the world markets.

The row between Ukraine and Russia for the Indonesian defence market has a history. In 2019, high-ranking representatives of Russia's Federal Service of Military-Technical Cooperation wrote a letter addressed to the Indonesian Air Force Commander, which Ukroboronprom regarded as an attempt to oust Ukraine from the promising Indonesian market. In turn, the then-CEO of Ukroboronprom, Pavlo Bukin argued that Ukraine had all the necessary documentation to ensure the maintenance, overhaul, and prolongation of the flight life of MiG, Il, Su, and Mi aircraft.

The letter was regarding the repair works on AL-31F engines powering the Indonesian Su-27s which the country planned to repair in cooperation with Ukraine. As a result, despite Russia's attempts to assume the right to repair the engines for these Indonesian warplanes, it was Ukraine which eventually sealed the deal. Furthermore, on several occasions in 2019, Spetstechnoexport supplied foreign customers with 100 mm ammunition for 2A70 cannons. Since Ukraine has no hardware with automatic 100 mm cannons in service, these munitions were delivered to the UAE and Indonesia, where they are in service with BMP-3 and BMP-3F infantry fighting vehicles although the original manufacturer of this equipment is Russia.

## The Pakistani Market

As for Spetstechnoexport's other results, in 2020, the company won a multi-million dollar tender in Pakistan. In particular, the Mykolayiv aircraft repair plant will repair the Il-78 tanker aircraft operated by the Pakistan Air Force (PAF). Furthermore, PAF has confirmed its intention to conclude the next package of contracts for the overhaul of two more tanker aircraft after the first deal is completed. The total volume of the repair programme will amount to more than US\$30M.

## The Indian Market

Only one Ukrainian arms exporter, Spetstechnoexport, which is part of Ukroboronprom, has the right to operate on the Indian market. Ukraine has long been tied to India by a major, long-standing contract for the modernisation of their An-32 fleet, which was a deal that allowed Ukraine to gain a foothold in this market. In 2009, Ukraine signed a deal to modernise hundreds of Indian An-32 aircraft – a contract worth about US\$400M. Considering the fact that in recent years India has been the world's main importer of weapons with a 12% share of world exports, their market, coupled with Ukraine-India military-technical cooperation, remains important.

Today, the range of cooperation between Ukraine and India has expanded to include e-warfare systems, modernised armoured vehicles, air defence systems, and aviation. Over the past six years, companies that are part of Ukroboronprom have developed solutions for modernising Soviet hardware in service in the India military. The developments of Ukrainian enterprises have been tested

in combat conditions and adopted by the Ukrainian Army. It should be borne in mind that the Indian market is another bridgehead in Ukraine's confrontation with Russia, since India today purchases over 60% of its military products and services from Russia. For 2020, Ukroboronprom has outlined big plans for cooperation with India and Spetstechnoexport has presented a new programme for the modernisation of T-72 tanks that are still in service, including in India.

digital communication systems and high-precision aircraft weapons. Joint projects to create a military transport aircraft, active protection systems for armoured vehicles, and radar systems are also relevant. In total, nearly 50 joint projects are being implemented.

Moreover, experts have raised the issue of the prospects for cooperation between Ukraine and Turkey in the development of the 5th generation TF-X fighter jet, with the possibility of further

Electric have been working on the TF-X engine in parallel. Russia's Rostec defence company has also shown interest in the TF-X project, expressing readiness to provide technology for the engine.

Considering that Turkey is looking for partners to develop the fighter, Ukraine could also partner up in this project, especially since the two countries already have a joint successful experience in creating drones. For example, Ukraine could engage in the development of jet engines.

Photo: Ukroboronprom.ua



**A model of the An-188 at the EurAsia Airshow 2018 in Antalya, Turkey. Turkish and Ukrainian aerospace officials are discussing the co-production of the Antonov An-188 military cargo aircraft, an advanced version of the Ukrainian An-178.**

## Ukrainian-Turkish Cooperation

Ukraine is developing military-technical cooperation with Turkey, and this does not only concern arms purchases, but is also about projects to jointly create new weapon systems. Two Ukrainian companies have been operating on the Turkish market – Spetstechnoexport and Ukrspetsexport. In 2019, Ukrspetsexport and the Turkish Baykar Defense, one of the leading UAV manufacturers, formed a joint venture in the field of precision weapons and aerospace technology. The main task of cooperation is to combine the capacities of the two countries' defence complexes towards the serial production of new models of modern weapons for their respective armies. One of the joint venture's first projects concerns the development of a new-generation UAV.

Furthermore, Turkish defence enterprises cooperate with Ukraine in the field of

updating Ukraine's own air force fleet. The TF-X is a stealth multirole fighter developed by Turkey's TAI (Turkish Aerospace Industries) together with the British BAE Systems. The maiden flight was scheduled for 2023, before being postponed for another two years. It is planned that the Turkish fighters will replace the outdated American F-16s and be compatible with the new fifth-generation F-35 fighters. At the same time, the TF-X should compensate for some of the shortcomings of the F-35 in close air combat.

As for the engine, it will take more than a year to develop their own jet engine. In this regard, Turkey plans to install imported engines on the first Turkish fighters, while at the same time developing domestic ones. To this end, the Turkish company Aselsan, which is involved in the TF-X project, said it had signed a Memorandum of Understanding with the international consortium Eurojet. TRMotor Power Systems Inc and General

## The Thai Market

Thailand is another traditional market for Ukraine and Bangkok has recently concluded a contract for the supply of 49 OPLOT-T main battle tanks within the framework of a contract concluded in 2011 worth more than US\$200M. The tanks were built at the Kharkiv-based Malyshev Factory. Created by an order of the Ukrainian MoD, the OPLOT MBT was put into service in 2009. According to experts, OPLOT has a very high technological complexity compared to other new combat vehicles (80%). The tank is equipped with modern comms protection and weapons control systems, including an active anti-precision arms system, as well as night vision devices. In 2018, Ukroboronprom completed the contract for the supply of OPLOT-T MBTs to Thailand. Since 2010, Ukraine has also supplied Thailand with BTR-3E1 armoured personnel carriers under a contract concluded for approximately US\$270M. The contract envisaged the delivery of 233 units by 2015. The final batch of 11 units was delivered to Thailand in March 2016. Thailand is also interested in further cooperation with Ukraine, in particular in BTR-3E1 modifications. A further cooperation agreement was signed in 2015 at the Defence & Security exhibition in Bangkok.

## Saudi Arabia

Saudi Arabia is interested in importing Ukrainian anti-tank missile systems and missiles, including the Luch Design Bureau's SKIF man-portable antitank missile system and the CORSAR light portable missile system. SKIF is an export version of the STUGNA-P anti-tank missile system, which is supplied to the Ukrainian Army. Its operating range is 5,000 metres. In 2018, some 950 Ukrainian-made missiles and ATGMs worth US\$57.85M were delivered to Saudi Arabia and in 2019, the exports amounted to 800 missiles and 150 ATGMs worth US\$51.321M.

## AN Aircraft

Many other Ukrainian manufacturers of military hardware, dual-use equipment, and components are also in demand worldwide. Ukraine's Antonov develops, produces, and repairs military cargo and passenger aircraft of the Antonov family. After the breakdown of cooperation with Russia, the company has been engaged in tackling the issue of import substitution with the further aim of establishing serial production of new aircraft models. During the All-Ukrainian Congress of Aircraft Manufacturers in August 2020, Antonov President Oleksandr Los proposed to engage in cooperation with Kharkiv State Aircraft Manufacturing Company towards the joint production of An-178 aircraft, with further development of the promising An-188 short take-off and landing military cargo plane, which will replace the Il-76 for the Ukrainian Air Force.

According to Antonov's CEO, the updated An-178 will be the first new-configuration Antonov aircraft produced without Russian equipment installed. CEO Los has announced that Turkey is interested in several An-178 planes. Both aircraft have promising potential on the international markets.

## Ukrainian Equipment Worldwide

Foreign customers are also interested in certain products made by Ukrainian enterprises. Zorya-Mashproekt manufactures turboshaft engines, for which supply contracts have been signed with India. The equipment is intended for various classes of warships with the Indian Navy. The contracts are set to be implemented within the period 2019-2020. In total, more than 150 gas turbine engines developed and manufactured by Zorya-Mashproekt have been installed on Indian Navy warships.

Ukraine has well-developed design, research, and production capabilities, as well as a significant export potential of turnkey radar systems. Ukraine's leading radar manufacturer is SE Scientific and Production Complex Iskra. This spring, Ukraine successfully tested an export version of the 90K6E mobile observation radar designed by Iskra. CEO of Iskra, Yuriy Pashchenko says the path is now open for the export of the new radar which is capable of detecting UAVs, including small targets, at various altitudes and maximum ranges. The first potential customer is a Middle Eastern country, according to CEO Pashchenko.

## Outlook

In general, the export markets for Ukrainian military equipment and components have been undergoing important transformations in recent years, many of which would have been impossible without severing cooperation with Russia. At the same time, many projects have had to be revised and even suspended due to the ongoing hostilities and the pressing needs of the Ukrainian Army in repelling Russian aggression. Now, Ukrainian producers are not only seeking new markets for import substitution, but they are also delivering hardware directly to the combat zone in the country's eastern region.

The private sector is also rapidly developing in Ukraine, while at the state level, the procedure for military exports has been greatly simplified after the government relinquished control over prices and sales markets for military equipment. Previously, private producers were supposed to obtain approvals from the state-owned defence giant Ukroboronprom. The new rules now ensure fair competition between public and private defence companies. Today, more than 150 defence firms in the private sector have export potential for armoured vehicles, precision weapons, UAVs, and counter-UAV equipment. ■

## AAD 2020: Can Defence Industrial Cooperation Solve South Africa's Problems?

(ah) Big were the plans the organisers had for this year's Africa Aerospace & Defence (AAD) tradeshow in Pretoria. Considerable international presence was announced and should underline AAD's significance as Sub-Saharan Africa's most important defence industry event against the background of increasing competition from other parts of the continent and of the notorious underfunding of the South African National Defence Force (SANDF). As with so many other events, the COVID-19 pandemic forced the organisers to go virtual instead.

While some attendees might have missed a discussion of current domestic and export projects, the virtual conference held on 15 October clearly took a forward-looking perspective. It focussed on Cyber Security and UAVs and their implications for a medium power like South Africa. The domestic drone market is taking a remarkable development, with a growing number of manufacturers, operators and service suppliers for civil and (para-)military purposes. The industry's offer includes supporting the armed forces by civil operation of UAVs in roles like training, disaster relief, anti-poaching, fishery

protection and even border security. Similar proposals with regard to coast guard operations had been made by Damen Maritime Security Solutions at the earlier Aerospace, Maritime and Defence (AMD) conference. The Dutch shipbuilder is currently providing the SANDF with three new Inshore Patrol Vessels, being built in Cape Town. At the AMD event, it was also called

for closer international industrial partnership and complementary defence imports which add value to domestic products in SA's high-tech niche markets.

The AAD team is optimistic to hold the smaller Defence and Aerospace Trade Show at Johannesburg's Lanseria Airport in March 2021. The next regular AAD is scheduled for September 2022.

Photo: Denel



**State-owned Denel Dynamics – here a SEEKER 400 – is among South Africa's major manufacturers of UAVs.**

# Keeping the “Birds” Flying



**Recently, ESD spoke exclusively with Mr. Shaul Mazor, Vice President for Marketing and Business Development at Bird Aerosystems, which provides self-protection systems for civilian and military aircraft. Moreover, Bird Aerosystems countermeasures and sensors are integrated into Czech Army helicopters (noted in the photos below).**

**ESD:** How do the Airborne Missile Protection System (AMPS) configurations differ from military and civilian airframes?

**Mazor:** AMPS developed by BIRD Aerosystems offers enhanced protection against Man Portable Air Defence Systems (MANPADS) missile threats for a variety of aerial platforms. In general, Civil and Military airframes have a different set of operational requirements and different certification requirements, which determine whether a system can be used. For example, one of the most obvious requirements relates to the System False Alarm Rate (FAR). While false alarms are accepted in the military environment, in the civilian environment it is completely unacceptable as it may lead to shooting flares over urban populated areas, which is a major safety issue.

BIRD's AMPS has solved this problem and has managed to completely eliminate the False Alarms of the system by using a unique sensor developed by BIRD, called MACS – Missile Approach Confirmation Sensor. By achieving an unprecedented value of practical zero FAR, MACS enables to comply with the EASA/FAA civil aviation regulations and to provide protection to civil and commercial aircraft against the threat of MANPADS.

**ESD:** How might these differ between rotor and fixed wing aircraft?

**Mazor:** The main difference is not in the system itself, but in the installation form: typically, on helicopters, the system will

Photos: BIRD Aerosystems



**Bird Aerosystems` AMPS in action**

be installed on the aircraft itself, and on fixed-wing, you would try to address the installation using an all-in-one pod that should be as much as possible cost-effective in terms of weight, size, and drag – as it has a significant influence on the fuel consumption of the aircraft. As an answer to this need, BIRD Aerosystems developed a several AMPS pods called Aeroshield, which are tailored for different aircraft – from VIP mid-size aircraft to wide-body aircraft. The Aero-

shield pod is designed as the lightest and smallest pod available today. It allows the integration of both the MACS and SPREOS sensors that provide protection while eliminating the False Alarms and enabling the aircraft to fly over urban environments.

**ESD:** What are the aircraft size restrictions – and why?

**Mazor:** The aircraft size typically implies on the maximum allowed size and weight

of the Missile Protection System, so for smaller aircraft, only a lightweight system can be fitted on. BIRD's AMPS system was designed to be versatile in the scheme of installation and is including a reduced number of LRU's – resulting in a very lightweight and easy to install system, enabling all-around platform compatibility.

**ESD:** What are the most appropriate airframes for AMPS?

**Mazor:** The AMPS was designed to provide complete protection in a modular way that can fit all types of aircraft, starting from very small helicopters such as the BK117 and EC-135 and going up to large jet aircraft such as B737, A320, and others.

**ESD:** Where is the AMPS deployed with various defence and policing customers?

**Mazor:** AMPS is fully operational on over 650 aircraft worldwide. Among our customers are the US Government, UN Air Operations, and NATO member countries such as the Czech Republic, which has installed the system on its Mi-17 helicopters and is currently upgrading its entire AMPS fleet.

**ESD:** How does the experience of defence and policing customers using AMPS compare and differ?

**Mazor:** The main difference is that defence customers usually tend to be early adopters due to their large budget and advance operational requirements. Later on, these systems also permeate from the defence sector to other sectors such as police and border protection.

**ESD:** Does operating in different environmental climates mean there are specific ways the AMPS is installed, deployed or used?

**Mazor:** AMPS was designed to be operational across the world in diverse climate conditions starting from the high humidity jungles of Columbia, where we have the AMPS installed on UH-60 BLACK HAWK and HUEY helicopters, up to the high-altitude desert environment of Afghanistan. In all of these conditions, the system can detect MANPADS missiles upon its launch and provide enhanced protection for the aircraft and crew.

**ESD:** What is the next step for this technology?

**Mazor:** The next step will be providing a hard kill solution to compliment the flare / DIRCM soft kill solution that is currently

available. The technology used by both the Self Protection Radar Electro-Optic System (SPREOS) and Missile Approach Confirmation Sensor (MACS) of eliminating the False Alarms and ensuring that only real missiles are reacted upon is the key building block that any hard kill system will require in the future. As such, it provides BIRD Aerosystems a unique position in approaching this development challenge.

**ESD:** How does MACS address and eliminate false alarms?

**Mazor:** MACS uniquely uses a Doppler radar, which confirms the incoming threat and enables optimal platform protection by flares. The Doppler radar quickly reacts to a pre-alarm initiated by the missile warning sensors, confirms the threat, and extract valuable real-time information such as its velocity and distance. This information is then used by the system to calculate the time-to-impact and accordingly initiate the most appropriate flare protection program against the threat. MACS is a unique patent developed by BIRD Aerosystems and is the only solution in the market today that offers such capabilities.

**ESD:** Where has it been used initiated in theatre?

**Mazor:** MACS has been sold to multiple customers and is used by high profile customers in challenging environments, including Somalia, Mali and others.

**ESD:** Why is the SPREOS DIRCM so very much sought after? How does it differ from other available counter-measure systems?

**Mazor:** The unique capability of BIRD's SPREOS DIRCM to use radar technology to confirm the threat and precisely track it makes it a real game-changer in the DIRCM market. It opens a wide range of new operational capabilities that do not exist in any other DIRCM solution. The SPREOS eliminates the False Alarms created by the optical sensors, hence ensuring that only real missiles will be acted upon. Additionally, the Doppler radar provides unique real-time information about the incoming threat such as velocity, range, and Radar Cross-Section (RCS). This information is used to initiate the most appropriate jamming technique against the missile while continuously tracking the missile to ensure the effectiveness of the jamming.

As the system offers a unique zero false alarm rate, it is able to alternatively combine protection by DIRCM and Flares that

enable protection against the most advanced MANPAD threats while ensuring that only real threats are engaged by the system.

**ESD:** What are the most appropriate airframes for SPREOS? Where has it been used in theatre?

**Mazor:** SPREOS is the most compact and lightweight DIRCM in the market and can be installed on a wide range of platforms ranging from very small helicopters to large wide-body aircraft.

SPREOS unique capabilities have been chosen by several customers around the world to protect a wide range of aircraft, including rotary wing helicopters and fixed-wing wide-body aircraft.

**ESD:** Why is AeroShield the only pod solution that can carry flares?

**Mazor:** The AeroShield pod uniquely enables platform protection using both flares and DIRCM. By integrating flares alongside BIRD's MACS or SPREOS confirmation sensors, which eliminate the false alarms, the AeroShield pod provides optimal platform protection against the most advanced threats.

**ESD:** How does AeroShield work?

**Mazor:** AeroShield is an all-in-one pod solution for the protection of narrow and wide-body aircraft. Integrating BIRD's AMPS in a compact all-in-one pod, AeroShield ensures the highest aircraft survivability while reducing the aircraft signature and drag. The AeroShield POD is easily installed and can be simply transferred between different platforms.

**ESD:** How does the solution for civilian aircraft (logistic / passenger) differ from large military aircraft?

**Mazor:** The AeroShield pod was designed to be the lightest and smallest pod in the market, to enable it to protect a wide range of civil and military fixed-wing platforms and to ensure the protection of the crewing aircraft while flying over unstable areas. The fact that the AeroShield pod uses both flares and a DIRCM ensures a much higher protection level than any other podded solution in the world. BIRD's AeroShield pod is certified by leading OEM manufactures and is currently delivered for Boeing 737, Airbus A320, Falcon 7X, and others.

**ESD:** Thank you for your time and insight.

**The interview was conducted by Stephen Elliott.**

# EURONAVAL 2020

## Naviris and Navantia update on the status of the EPC programme

**ESD's long-standing correspondent Giulia Tilenni shares her insights from this year's trade show.**

In a roundtable chaired by Jean-Marie Dumon (GICAN), representatives of Naviris (the 50/50 joint venture between Naval Group and Fincantieri) and Navantia outlined the details of the European Patrol Corvette (EPC) programme. Domenico Rocco, Naviris' sales manager, and Yann Floch, head of the engineering department, recalled that France and Italy had already agreed on the programme in 2019, and that Greece and Spain both followed this year.

Should the number of participants remain unchanged, operational requirements from the Italian, French, and Spanish Navies will likely be defined by the end of the year, thereby allowing for the completion of first prototypes in 2027. Meanwhile, Naviris and Navantia (which recently became a first rank partner in the project) elaborated a preliminary hypothesis on how the EPC could look, in order to better identify which are the most innovative aspects of the project "according to the expectations of the European community", as Mr Rocco said. These will be presented in November as part of the bid for the European Defence Fund (EDF), which could cover up to 10 per cent of the total programme costs, meaning early/common activities can be undertaken. Once EDF rules and constraints are clarified, companies could then bid for additional funding.

Pictures and technical figures presented at the workshop reminded participants of existing vessels with a similar displacement (2,800 to 3,000 tonnes), especially Fincantieri's corvettes delivered to Qatar earlier this year. At this stage, it is difficult to envisage cutting-edge features deserving specific EU funding. It is likely that the navies' requirements will find a way of introducing elements that will please Brussels in exchange for EU funds.

Photo: via author



*Despite the COVID-19 pandemic Euronaval, the international exhibition for naval defence and maritime security, took place in Paris le Bourget.*

Photo: Euronaval



*This year, a series of three web conferences replaced the international conference initially planned at the Maison de la Chimie. Organised in partnership with the Foundation for Strategic Research (FSR), these web conferences took place over three online sessions in the form of thematic round tables.*

### Author

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

## “Stand-off MCM Capability” Organised by Belgium Naval & Robotics

Representatives of the Belgian Navy and Belgium Naval & Robotics (ECA Group and Naval Group) consortium unveiled the logo of the Mine Counter Measure (MCM) programme jointly developed with the Dutch Navy, and focused on its operational gains – safety and speed. In terms of safety, the crew will be far from minefields. The warship is designed according to NATO standards and has a low electromagnetic and acoustic signature. The vessel also has drones, which, although adapted to meet requirements, are all sea proven. Speakers at the roundtable recalled the warships’ features, with a focus on the mission bay and the Combat Management System (which can be embedded in a task force). Mission-oriented training, including virtual reality modules, can be available before the beginning of a new mission. Ideally, 33 out of the 63 crew members are specifically trained for the use of the modules due to the fact that collected data can be downloaded and exploited away from the ship.

Aymeric Moullart de Torcy (Naval Group) and Antony Penn (ECA) highlighted the “Toolbox”, the new concept at the heart of the programme, which attracted the attention of the Belgian and Dutch Navies. The drone system (UMIS) has a completely scalable configuration, with the possibility to use different toolboxes according to mission requirements. With the preliminary design review set to end in two months, the first steel cut is expected in June 2021. Despite such an advanced MCM programme, the Belgian Navy does not plan to totally abandon legacy capabilities. To this end, some facilities will remain operational and experienced personnel will continue to work on legacy systems to mitigate the risk of losing relevant know-how.

## SH Defence “The CUBE”: the Future of Multipurpose Vessels

Nowadays, Offshore Patrol Vessels (OPVs) are less multipurpose than they could be, as it usually takes months, in addition to funds to adapt them to different mission profiles. SH Defence’s The CUBE, a patent pending multipurpose module for vessels launched earlier this month, provides a solution to this issue. The CUBE can be shipped worldwide on adapted ISO containers and offers full flexibility to warships (plug and play solution that can be exchanged in any port within four hours, according to needs). The loading system is also based on containers, thus confirming the limited logistic footprint of the whole system.

The CUBE is available in 128 configurations, from water purifiers to complex sensor systems and has several advantages. It can be mounted on mission bays, a crucial feature in terms of weight and space-saving for emergency missions. Also, it can be an excellent sea-based or land-based asset in case of international missions and in case of a health crisis. For instance, The CUBE could be used to establish mobile COVID-19 test centres in remote areas. It could ideally be shared by armed and security forces of an individual country, or within an international organisation (e.g. NATO). The company’s director, René Berthelsen, explained that The CUBE is a win-win concept: cost efficient for taxpayers (usually more interested in multipurpose vessels than in warships), and quick and flexible for Navies. Indeed, The CUBE could increase the OPVs’ utilisation rate to 40-50 per cent. Since its launch three weeks ago, 16 potential customers have already initiated discussions with the company.

## Masthead

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Cover photo: US Army

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## S80 Submarine Programme Updates

In an interesting video presented during its workshop, Navantia explained how the Cartagena shipyard has evolved to adapt to the challenge of building the S80 submarine, the first fully indigenous submarine and the only 3,000-tonne AIP submarine produced worldwide. Investments concerned the physical infrastructure (e.g. creation of dedicated workshops and the purchase of robots to increase automation), digital infrastructure (e.g. simulators), and the development of the critical systems to be mounted on board

(combat systems, management system, communication system). After a delay in making progress due to COVID-19 (which forced the company to postpone the first set afloat to the beginning of 2021), Navantia has now fully resumed its activities and recovered the delay. The BEST (Bio-Ethanol Stealth Technology) Air-Independent Propulsion system is among the key features of this programme, as it provides for submerged endurance of up to three weeks. Questioned on the reasons for this unprecedented choice, shipyard Engineering Director, Germán Romero Valiente, explained that the company chose bio-ethanol as this is a safe (non-toxic), low-cost solu-

tion available worldwide. BEST is at the core of one of the current challenges Navantia is working on, namely the combination with Li-ion batteries, which are being studied in collaboration with French company Saft for eventual integration on the S80. Indeed, this feature was not integrated in the current design but is interesting for customers, including the Spanish Navy. The retrofitting of batteries on the overhauls is included in the company's roadmap but will depend on interest from the different Navies. Navantia is also working on the integration of Unmanned Underwater Vehicles (UUVs) on its submarines.

## THALES Presents the BLUESCAN Integrated Sonar Suite

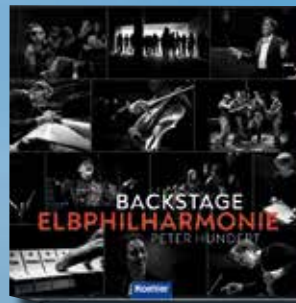
During EURONAVAL 2020, Thales presented the BLUESCAN acoustic data management suite dedicated to anti-submarine warfare (ASW), and designed to be installed on board naval vessels. This technology allows for merging multiple sonar signals into a recognised acoustic picture of the area of operations. It provides operators with an acoustic situational awareness that facilitates quick and informed decisions. Useful in any context where ships, helicopters and aircraft jointly operate, the suite will become indispensable with the expansion of fleets of USVs, UAVs and UUVs and their capabilities, a representative of Thales stated. As the management of these fleets and of huge amounts of data could be eased thanks to artificial intelligence (AI), BLUESCAN integrates some AI elements to be further developed in the near future. The issue of connectivity amongst the different systems was identified as BLUESCAN's main technical challenge. To facilitate data management and transmission, Thales will empower each sensor to perform a preliminary analysis of sonar signals and select only the useful information. BLUESCAN will then aggregate and disseminate the synthetic information received. The programme, currently in its V1, is conceived as evolutionary. In the V2 version, the current sonar suite will allow for the integration of multiple sources from different operating environments. The final V3 version is expected to provide a global approach to acoustic surveillance that might include a land-based command centre, a dedicated server, and a cloud.

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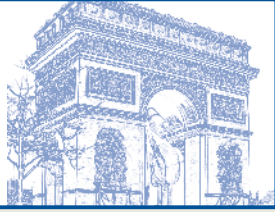


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# Viewpoint from Paris



## You can either laugh or cry! Britain's Armour Embarrassment

**David Saw**

Sitting in Paris and evaluating the state of armour in the French Army is a rather satisfactory experience these days. There are well-structured current programmes that are delivering capability and future programmes that are well planned and on deliverable timescales. In contrast, the picture as regards armour in the British Army is at best mixed, but for once, there are actually some positive developments! Sadly, these are overwhelmed by the usual cascade of negativity.

For once, there is actually some interest in discussing the current state of armour in Britain. In July, the Parliamentary Defence Committee began an inquiry. Their objective was to "focus on the procurement and use of Armoured Fighting Vehicles (AFVs) and whether more must be done to ensure the Army's ability to deploy an armoured division. It will assess how the Army envisages employing AFVs in future operations." The inquiry called for written submissions to be received by September and followed this up with two formal sessions to hear oral evidence in October. This saw the committee receive evidence from government ministers, procurement officials, military officers, industry, journalists and consultants.

The committee set the scene as regards the state of British armour: "The British Army's current fleet of Armoured Fighting Vehicles (AFVs) is characterised by increasing age and creeping obsolescence." There are steps being taken to change this situation, some successful and some not. However, the elephant in the room is the Integrated Review (IR) being conducted by the government into Britain's future defence priorities. This could change everything as far as programmes, requirements and funding are concerned, and most likely these changes will not be for the best.

As things stand at present, there are four major armoured vehicles programmes in Britain. The Mechanised Infantry Vehicle (MIV) was awarded last year with the selection of the BOXER vehicle. This is a £2.6Bn programme for 508 high-mobility me-

dium-weight infantry vehicles. Putting to one side the fact that they could have purchased BOXER years ago, the current status of the project is positive presumably because there has not been enough time to mess it up!

Then you have the AJAX programme valued at £5.5Bn for 589 vehicles in six different variants. First deliveries were delayed in May 2020 due to problems with the vehicle. Confidence in the AJAX programme is high though. Neither BOXER or AJAX will be impacted by the IR. The other two programmes – CHALLENGER 2 Life-Extension Programme (LEP) and WARRIOR Capability Sustainment Programme (WCSP) – will be subject to the IR.

Much debate surrounds the CHALLENGER 2 LEP programme, ranging from the age of the tank is over, to tanks are needed and the upgrade is vital, to its impossible to viably upgrade a CHALLENGER 2, or lets buy another tank as an interim measure and join a future tank programme, European or otherwise. Or perhaps they could do nothing and just think about the issue! Jeremy Quin MP, Minister for Defence Procurement at the MoD, told the Defence Committee that CHALLENGER 2 LEP is capable of reaching main gate business approval before the end of this year and at that point they will decide if the programme is go or no-go. Other options to meet the same objectives will also be studied, but then the IR was mentioned once more, implying that this would be the decisive factor for the programme.

Finally, we have WARRIOR. There are currently 767 of these vehicles in British service. The aim appears to be to upgrade in the region of 600 vehicles, with an ISD of 2024, seven years later than the original plan. This programme remains troubled and with the IR in progress, it must be considered very vulnerable.

Of the four British armour programmes, two look solid and two look vulnerable. By contrast, in France, they are upgrading 200 tanks and introducing three new armoured vehicles types into service and have their future armour plans all mapped out. Why is it impossible for Britain to manage something similar?

# Small Arms Ammunition – Trends and Suppliers

**David Saw**

The provision of a reliable supply of small arms ammunition would seem to be absolutely fundamental for any national military organisation. Indeed, there was a time when it would have simply been inconceivable that a nation could not meet its small arms ammunition needs from domestic resources.

Indeed, the ability to manufacture small arms and their associated ammunition was the basic building block upon which most national defence industries had been built.

To gain an understanding of the current state of the small arms ammunition sector it is necessary to discuss the complex interaction of political, strategic, technological, industrial and operational factors that have created this sector. Beyond that, technological change driven by operational requirements could transform the future of this sector. Consequently, small arms ammunition, perhaps to the surprise of many, is an area where disruptive change is highly likely to further reshape the sector both operationally and industrially.

Looking at small arms ammunition in the context of Western Europe the trend lines start from complexity and confusion, they then gradually evolve into standardisation and stability, followed by uncertainty that eventually brings further standardisation in its wake. We are currently in a period where standardisation, in the main, is the prevailing situation in the small arms ammunition sector. However, that situation could be coming under threat as the US Army is moving towards the acquisition of a new generation of small arms which do not utilise standard NATO calibres. If the US does opt for this new small arms system and new ammunition, that new ammunition will become the de facto NATO standard. The dilemma for the other NATO nations will be a binary choice of do they stick with current NATO standard ammunition or do they fall into line behind the US? All of which means there is much to discuss in terms of small arms ammunition.

## Western Europe

Our starting point for an analysis of small arms ammunition is a look at the multiplicity of calibres that used to be



Photo: US Army

**Reloading an M4A1 carbine, the M4A1 is the latest version of the M16 family that has been in US Army service for 60 years. Its 5.56x45 mm ammunition has been NATO standard for 40 years. Efforts to replace this weapon system with a new weapon and a new calibre have failed thus far.**

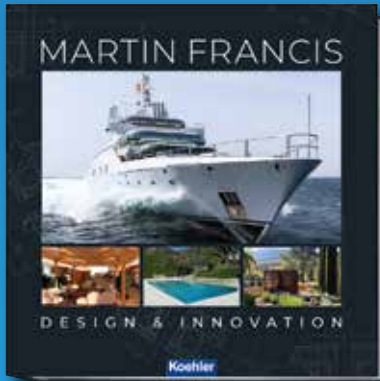
employed in Western Europe. We have listed the calibres used by a selection of European nations, plus some external actors: Belgium 7.65x53 mm, Britain .303 (7.7x56 mmR), Czechoslovakia 7.92x57 mm, Denmark 8x58 mmR, France 7.5x54 mm (this would remain the primary French rifle round until the 1970s), Germany 7.92x57 mm, Netherlands 6.5x53 mmR, Norway 6.5x55 mm, Spain 7.65x33, transitioning to 7.92x57 mm, Sweden 6.5x55 mm (same round as Norway), Switzerland 7.7x55 mm (remained the primary Swiss rifle round until 1990), Soviet Union (Russia) 7.62x54 mmR (still in service primarily as a machine gun round) and the US 7.62x63 mm (.30-06). Of the 13 nations listed, six used Mauser action battle rifles, three used 7.92x57 mm rounds, while two used 6.5x55 mm rounds. Without doubt, weapon and round diversity was king!

## Ammunition Standardisation

A number of factors conspired to transform the small arms and associated weapon picture in Western Europe and subsequently in Eastern Europe. These factors would be political, economic, strategic and operational/tactical. The road towards ammunition standardisation in Europe starts with the end of the Second World War. At this point in Western Europe, as national armies were re-established most were equipped with US small arms, primarily the M1 GARAND semi-automatic battle rifle in 7.62x63 mm and the M1 carbine in 7.62x33 mm. In 1949 and 1950, Belgium placed contracts for its first postwar battle rifle, semi-automatic the FN SAFN, with over 87,000 acquired, the calibre chosen was the US 7.62x63 mm. US small arms and ammunition would remain dominant in Europe through the 1950s.

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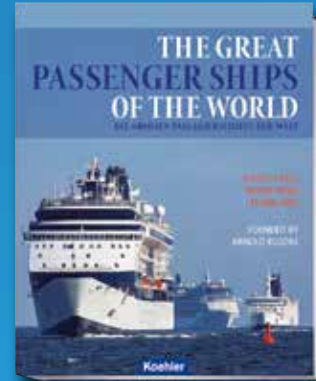
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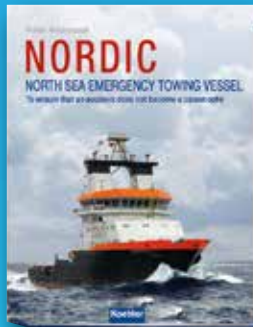
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Photo: Textron Systems

**Textron Systems have been working on advanced small arms concepts under contract to the US Army for many years. The weapon shown here is their prototype for the NGSW programme. The Textron weapon uses case-telescoped (CT) ammunition, the company has been working on CT rounds since 2003.**

Change was on the horizon though. It had long been thought that traditional full-power rounds, such as the US 7.62x63 mm or the German 7.92x57 mm, were unnecessarily powerful. They offered extended ranges which might be attractive in machine gun applications, but in rifle applications the extended range was not required as there was plenty of data that illustrated that normal engagement ranges were around 300 metres and rarely took place beyond 550 metres. This led to the development of what we know today as the intermediate cartridge, the first of which to appear was the German 7.92x33 mm Kurz round, which was followed by the Soviet 7.62x39 mm M1943 round. The availability of the intermediate cartridge made it possible to develop what we now know as the assault rifle, a select-fire weapon, offering fully controllable automatic fire and capable of combat ranges of 300 metres out to 457 metres. It was now possible to develop new small arms that would replace the old bolt-action rifles and semi-automatic rifles. This saw the British develop the EM2 rifle along with a new 7x43 mm intermediate round, while FN in Belgium developed the FAL, initially in 7.92x33 mm and then in 7x43 mm British. Other factors would come into play though, these factors being both political and economic. It was obvious that the US would be the dominant western power and the primary guarantor of security in Western Europe. Following on from that, it was clearly sensible for the British to achieve standardisation with the US, and small arms ammunition was a logical place to start, but Britain was very short of funds at this point and it was decided to wait and see what would happen next. This was due to the fact that the British were aware that the US was working on a new round as a potential replacement for their standard 7.62x63 mm.

### The Formation of NATO

By 1949, there was an understanding the US, the UK and allied nations would work towards the standardisation of small arms and their associated ammunition. The formation of NATO further strengthened the pressure for standardisation. The understanding at the time was that both US and European weapons and ammunition would be trialled and that the best combination would be adopted across NATO.

The problem was that while the Belgians and the British were believers in intermediate rounds and the road to the assault rifle, the US Army had a totally different view. The US envisaged a round with a range of out to 1,829 metres (2,000 yards) that would be suitable for both rifles and machine guns. They actively worked against the adoption of an intermediate round and certainly had no intention of adopting non-US small arms. The end result was the standardisation across NATO of the 7.62x51 mm round (with the exception of France who retained their 7.5x54 mm round).

There were other elements of ammunition standardisation that emerged with NATO, although via a less dramatic route than the 7.62x51 mm. This saw the adoption of the 9x19 mm round as a NATO standard for pistol and submachine gun applications. At the top end the wide distribution of the M2HB heavy machine gun made the selection of its 12.7x99 mm (.50 BMG) round as a NATO standard inevitable.

### Eastern Europe

In Eastern Europe, the move to common calibres was much more straightforward, with the exception of the former Czechoslovakia. They had designed an indigenous intermediate cartridge of 7.5x45 mm cali-

bre and had designed a family small arms to utilise the new round in shape of the Vz.52 semi-automatic rifle and the Vz.52 magazine-fed light machine gun. This rare display of independence in the Soviet Bloc did not last long and both weapons were converted to fire the standard 7.62x39 mm M43 rounds. Subsequently, both weapons were replaced at the end of the 1950s by the Vz.58 assault rifle in 7.62x39 mm and the Vz.59 universal machine gun in 7.62x54 mmR.

Elsewhere in the Soviet Bloc, it was a matter of standard weapons and standard calibres. The assault rifle and light machine gun in 7.62x39 mm, the general purpose machine gun in 7.62x54 mmR and heavy machine guns in 12.7x108 mm or 14.5x115 mm. The standard sniper weapon was the DRAGUNOV SVD in 7.62x54 mmR, although the specialist 7N1 round was used to provide increased accuracy. In current terminology the SVD would probably not even be referred to as a sniper rifle, it was widely deployed at squad-level and used at ranges of 600 to 800 metres and would in current parlance be treated as a designated marksman rifle (DMR).

With the NATO and Warsaw Pact nations having adopted a set of standardised calibres, and with superpower competition in full effect, these standardised calibres became globalised. Indeed, the legacy of this globalisation can still be seen today. It is debatable whether there is any part of the world that has not been graced by the KALASHNIKOV assault rifle and its 7.62x39 mm ammunition for either good or ill.

There was also the situation where some countries found themselves equipped with a diverse range of small arms and their accompanying calibres. India provides an excellent example of how complicated meeting highly diverse small arms ammunition requirements could be. At one stage they were still producing British .303 (7.7x56 mmR), as well as NATO calibres in the form of 9x19 mm and 7.62x51 mm and then Soviet 7.62x39 mm for their assault rifles.

The fact that standard small arms calibres had been globalised in terms of both users and manufacturers to an unprecedented degree, would, at least superficially, appear to be excellent news for those seeking affordable sources of ammunition supply. Sadly, while the calibres and the overall specifications of rounds might have been standardised, there was no guarantee that the performance of a round would match the expected standard. Hence a need for a rigorous testing regime when acquiring ammunition, although such testing was not possible when the ammunition in question was provided as military aid. Some

years ago the British acquired a stock of 9x19 mm from India from use with pistols and submachine guns, these rounds were later withdrawn from service as they did not consistently meet the NATO standards. On the other hand there was a time when if you acquired Chinese 7.62x39 mm ammunition it was a good idea to avoid using it in Soviet weapons as the performance was often underwhelming!

## Seeking Revolution

In the NATO nations, the selection of the 7.62x51 mm as the standard round could be considered as a victory for those of a conservative disposition. Their views were that marksmanship was incredibly important, even out to extended ranges, and that the key was one round for one hit. Extended ranges were also essential for machine guns, as these weapons would provide the infantry with the required suppressive fire. In contrast, individual automatic weapons like assault rifles led to soldiers being profligate with ammunition, and this would cause problems in terms of supply on the battlefield as ammunition usage rates would rise to an unsupportable level. Linked to this was the view that assault rifles and their intermediate rounds lacked the necessary accuracy for use on the modern battlefield.

There were others who looked beyond the contest between the battle rifle and the full-power round versus the assault rifle and the intermediate round, seeking new small arms solutions. This saw a number of projects conducted under the umbrella of the Special Purpose Individual Weapon (SPIW) programme in the US, one of the first of these was Project Salvo that was based on the premise that a lighter weapon with a high rate of fire was what was required: Bear in mind this was happening as they were imposing the 7.62x51 mm round on everyone. The solution chosen was a weapon with a new round that contained a single fléchette – conceptually interesting but it led nowhere.

The next evolution in small arms ammunition development was to see the concept of a lighter weapon with a high rate of fire become a reality, although in this case the ammunition utilised would be conventional rather than 'exotic!' This would finally take the NATO nations into the realm of the assault rifle via the 5.56x45 mm round which became the NATO standard. The arrival of this round was influential in that it acted as the catalyst for the Soviet Army to downsize to a new 5.45x39 mm round in a new AK74 rifle.

On the other hand, although the US would manoeuvre NATO towards a conventional

5.56x45 mm solution in terms of assault rifles, it would also continue to look for a successor system and would embrace all sorts of technologies in its search for next generation small arms. Indeed, the US has been striving to field next generation small arms since the 'Future Rifle Program' at the end of the 1960s, less than five years after

Weapon (OICW). This was a combination assault rifle and a launcher for 20 mm air-burst munitions that was type classified as the XM29. This was then split into two programmes, the XM8 assault rifle and the XM25 grenade launcher. XM8 was cancelled in 2005 and the XM25 was eventually terminated in 2018.



Photo: USMC

**A .50 BMG (12.7x99 mm) heavy machine gun shoot being prepared by the US Marine Corps at Camp Lejeune, North Carolina. The Marine Corps has placed an order for 2.4 million rounds of .50 BMG ball and AP ammunition with polymer cases seeking to reduce ammunition weight by 15 to 30%.**

the US Army had adopted the M16 rifle in 5.56x45 mm M193. The 'Future Rifle' was a fléchette-based weapon and again it failed to deliver satisfactory results.

With the M16 in US service, Small Calibre High Velocity (SCHV) weapons became the centre of attention to supplement/replace 7.62x51 mm battle rifles. In 1970, NATO agreed that it would standardise on a new small calibre round. Eventually this led in 1980 to the NATO standardisation of the 5.56x45 mm SS109 round developed by FN. A new standard round might seem to indicate long-term confidence in 5.56 mm. Indeed, the US Army would go on to adopt a new version of the M16 in the form of the M16A2. Yet at the same time, it also commenced work on a new rifle programme, the Advanced Combat Rifle (ACR), as a replacement for the M16.

By 1989, the ACR programme had reached its third phase with five prototype weapons selected: AAI with a fléchette system; Colt with a M16 derivative firing a 'duplex round,' a single round with two projectiles; Heckler & Koch (HK) with the G11 and a caseless round; and Steyr with a fléchette system. The ACR offered possibilities but not enough to stop the programme being cancelled in 1990, as the US Army looked for a new solution in the form of the Objective Individual Combat

Two major programmes established to produce a successor to the M16 and the 5.56x45 mm round had ended in failure, with the M16 remaining in service. In 1994, the M4 version of the M16 entered service with the US Army, with the improved M4A1 version being contracted for in 2013. The longevity of the M16 operating system and its 5.56 mm ammunition is to be admired, as of 2020 it will have been in US Army service for more than 56 years. And while the US Marine Corps has adopted the M27 Infantry Automatic Rifle (IAR) from HK as the replacement for its M16A4/M4 weapons it still remains wedded to the 5.56x45 mm round.

The inability to find a replacement for the M16 does not indicate that there has been a lack of innovation in the small arms sector. There have been improvements in sights, fire control systems in general and in the materials used in the construction of weapons and their accoutrements. Ammunition has also benefitted from improvements, such as improved propellants and design advances. This has seen the fielding of the M855A1 5.56 mm and 7.62 mm M80A1 Enhanced Performance Rounds (EPR) by the US Army and the 5.56 mm Mk 318 and 7.62 mm Mk 319 rounds by the US Marines and SOCOM. Australia has introduced the improved F1A1 5.56 mm round, produced



**True Velocity is part of the General Dynamics - Ordnance and Tactical Systems (GD-OTS) team for the NGSW programme providing its TVCM composite-cased 6.8 mm ammunition. The company also makes composite-cased 5.56 mm, 7.62 mm and .50 BMG ammunition.**

by Australian Munitions (part of Thales Australia), while Britain has introduced a BAE Systems 5.56 mm Enhanced Performance (EP) 5.56 mm round and a 7.62 mm High Performance (HP) round, both feature a heavier bullet offering increased penetration at range. A sniper variant of the HP round is available, and is built to a higher quality specification.

## The Current Scene

The current scene as regards the small arms sector and its associated ammunition remains complicated and extremely diverse. Some recent acquisitions by the French military demonstrate how this works. In early 2020, the Direction générale de l'armement (DGA) announced the selection of the Glock 17 Generation 5 for the Pistolet Semi-Automatique (PSA) requirement, with the 9x19 mm ammunition for the pistols being provided by Sellier & Bellot of the Czech Republic. Separately, the DGA announced the selection of the FN SCAR-H PR for the Fusil de Précision Semi-Automatique (FPSA) 7.62x51 mm DMR with the ammunition for the new weapon being acquired from MEN Metallwerk Eisenhütte GmbH from Germany.

France was one of the pioneers of modern small arms ammunition technology and it was not that long ago that it would have been inconceivable that the French military would buy weapons with non-French ammunition. What is interesting is that both Sellier & Bellot and MEN are actually part of CBC Global Ammunition, an operating unit of the Brazilian CBC company that was established some 92 years ago. CBC state

that they manufacture 1.7 billion rounds of ammunition per year and that they are the largest privately-owned manufacturer of 12.7x99 ammunition in the world. To close the circle, both CBC and MEN have also sold 12.7x99 mm and 7.62x51 mm ammunition to the British Army, while BAE Systems has sold 5.56x45 mm to the French Army in recent years.

In general, small arms ammunition is based on long-term contracts with major suppliers. Inevitably, the British will contract with BAE Systems for example, others in Europe will turn to major suppliers such as NAMMO. Ongoing military operations around the world often create requirements for ammunition beyond those specified in long-term contracts, creating a significant market for off-the-shelf purchases. These purchases often lead to significant price fluctuations and even to shortages in particular calibres.

In the US, you have government-owned facilities such as the Lake City Army Ammunition Plant in Missouri, which in this case is contractor-operated by Northrop Grumman Innovation Systems. US gun laws and interest in shooting sports/hunting sustain domestic ammunition production by many private companies, while also acting as a significant export market for foreign companies. Mention as well ought to be made of major ammunition manufacturers such as India's OFB and Pakistan Ordnance Factories (POF). Their primary customers are their national military forces, but both companies export.

## Technology Innovation

There is also technology innovation taking place. The US Marine Corps recently placed a US\$9.98M order for up to 2.4 million rounds of Mk 323 Mod 0 12.7x99 mm ammunition in both ball and AP natures over the next three years with MAC Ammunition of Mississippi (NAMMO has an ownership position in this company). The significance of this order is that the ammunition is polymer-cased and the US Marine Corps has specified a weight reduction of between 15 and 30% compared to conventional rounds.

Potentially more significant though is the US Army Next Generation Squad Weapons (NGSW) programme that aims to replace the M4/M4A1 rifles and the M249 machine gun. Three prototype systems have been selected and while they each have different ammunition concepts, each contender must use the US Army mandated 6.8 mm projectile. The Textron Systems submission uses a case-telescoped round, the General Dynamics - Ordnance and Tac-

tical Systems (GD-OTS) submission uses composite-cased ammunition from True Velocity, while the SIG SAUER submission uses an in-house round described as a hybrid compact high pressure round. NGSW prototypes are currently being evaluated. Should this lead to the US Army selecting a new small arms system and a new calibre, that will inevitably change the small arms environment in NATO although much has to be done before that stage is reached. Finally, mention must be made of Special Forces purchasing weapons in non-standard calibres. In January 2020, US-SOCOM completed the purchase of MG 338 machines guns from SIG SAUER in .338 Norma Mag (8.6x63.3 mm) calibre. The Netherlands is looking for a DMR in 6.5x51 mm Remington, while a host of other rounds such as 6.5x39 mm Grendel,



**The 6.5 mm Creedmoor round, in this case manufactured by Sellier & Bellot, is one of the many rounds that have emerged out of the US in recent years as an alternative to standard 7.62 mm and 5.56 mm rounds. Special Forces have proven to be a major market for non-standard calibre rounds.**

6.5 mm Creedmoor, 6.8x43 mm Remington SPC and .300 AAC Blackout (7.62x35 mm) are just some of the rounds that have been utilised by military and paramilitary customers in recent years.

In summary then, the small arms ammunition sector is in a period of uncertainty. It is possible that nothing will really change, with the exception of polymer or composite cases in existing calibres, with Special Forces continuing to utilise more 'exotic' calibres. If the US Army manages to make the NGSW programme a reality then real change, perhaps even revolutionary change, is possible. However, previous experience of US Army efforts to change the game in small arms have not proven to mark decisive change, but there is always a first time! ■

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