

European Security & Defence

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International Security and Defence Journal

Armoured Vehicles



"Our citizens ask for a better Union"

Federica Mogherini on the future of Europe's Foreign and Security Policy in the light of new threats



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The OSCE is Facing Great Challenges



On 1 January 2016, Germany took over the chair for a year in the Organisation for Security and Co-Operation in Europe (OSCE) whose participating states include all European countries, the USA, Canada, the successor states of the Soviet Union, as well as Mongolia. The OSCE promotes humanitarian, economic, ecological and technical co-operation and often sends election observers. The main executive body is the Permanent Council. The Secretariat in Vienna has approximately 200 employees. More than 2,500 additional people work for the organisation in missions and offices in 17 countries. The annual budget amounted to €145 million in 2013. The predecessor of the OSCE was the Conference on Security and Co-Operation in Europe (CSCE). The signature of the CSCE Final Act in Helsinki in 1975 contributed to detente in the East-West conflict. In 1994, the CSCE was renamed OSCE. At the time, in Paris the states agreed upon the visionary concept of a security community encompassing the continent from Vancouver to Vladivostok, which they still confirmed at an OSCE summit in Istanbul in 1999. The states committed themselves not to pursue their own security interests to the detriment of other states in the OSCE, a topic which is more important than ever today. However, many people felt anxious in view of the crises and wars within and on the borders of Europe. Thus, new tensions developed, this time with many states of the former Warsaw Pact on the side of NATO. As a result, a renewal of the Treaty on Conventional Armed Forces in Europe (CFE) failed, due to differences of opinion regarding the stationing of Russian soldiers in the Republic of Moldova and in Georgia. "Since the 2000's, the OSCE has experienced an erosion in the discharging of its obligations", explained a high-ranking diplomat of the German Foreign Office. However, the Ukrainian conflict acted as a catalyst for the revival of the OSCE, because, principally, the OSCE has the instruments to stem violent conflicts. Russia

as well as the USA belongs to the OSCE. How difficult this is, however, became apparent during the Ukraine crisis.

Even starting a mere dialogue of the 57 OSCE member states often appears to be an insoluble problem. This was the experience of a team managed by of the German diplomat Wolfgang Ischinger. The group of ex-politicians, diplomats and scientists was to undertake damage assessment of the Ukraine crisis and to explore the possibilities of a dialogue on European security. However, they only agreed on the fact that the situation offered "serious risks". Opinions suddenly differed regarding how the crisis originated. Thus, three different versions exist in parallel in the group's report: that of the West, that of Russia, and that of the "states in-between".

The OSCE is facing great challenges. Besides the security situation, topics of business and the environment should be more prominent under the German chair. The organisation is to position itself more strongly on tolerance and media freedom and to name deficits in the member states. So that the OSCE can master all these challenges, German Foreign Minister Frank-Walter Steinmeier wants to ensure that the organisation receives more funds. However, to make sure that the OSCE can do effective work, it must be strengthened as an organisation. The fact that the states in the OSCE call themselves "participating states" rather than member states shows that they remain stuck in the transition from Conference to Organisation. Yet to implement proposals, the German Government must convince each of the 57 OSCE states, because the principle of unanimity applies. All the same, there is a broad consensus that the OSCE is important as a platform for dialogue on security issues. With its chairmanship, Germany has the power to some extent to create new trust and with it to make Europe safer again.

Henning Bartels

Strategic Defence & Security Review 2015



After an almost uninterrupted series of reductions in equipment and personnel since the end of the Cold War, the UK's SDSR 2015 heralds modest increases in force numbers and capabilities. [Page 13](#)

"Make in India"



Under the banner of an ambitious programme India is re-inventing the basket of military diplomacy as the country aims to transform itself from the world's largest arms importer into a defence manufacturing hub. [Page 82](#)

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■ Italy Transfers Assets to EATC

(df) Transfer of most of the Italian Air Force air transport, air-to-air refuelling and aero-medical evacuation assets under the op-

(Photo: Italian Air Force)



erational leadership of the European Air Transport Command (EATC) has been formally implemented on January 12, 2016. Inaugurated in 2010, EATC is the multinational command tasked with managing

and engaging assets assigned by Participating Nations to this European initiative. The European Air Transport Command, located at Eindhoven (NL), implements the Pooling and Sharing concept in the sector of military air transport, in line with the Common Security and Defense Policy. Its objective is to improve and optimize the management of available resources, thanks to standardized procedures and the employment of a common fleet, larger than individual countries' ones, with considerable cost savings. The Italian "Transfer of Authority" will be implemented for 31 assets, including C-27J, C-130J, and KC-767 aircraft. The Italian Air Force can regain control of the aircraft based on national requirements thanks to the envisaged Revoke Transfer of Authority mechanism. These 31 assets are now part of the EATC multinational fleet, which

amounts now to more than 220 military air transport aircraft representing over 60 % of all military air transport assets in Europe. The members of EATC are Belgium, France, Germany, Italy, Luxembourg, Netherlands and Spain.

■ GMLRS AW for the U.S. Army

(df) Orbital ATK has been awarded a €13 million contract by Lockheed Martin to produce its Guided Multiple Launch Rocket

(Graphic: Orbital ATK)



System (GMLRS) Alternative Warhead (AW) for the U.S. Army. In tests, the Orbital ATK warheads with Lethality Enhanced Ordnance (LEO) technology achieved the Army's stated requirements for area effects, but left behind no unexploded ordnance, a major accomplishment for this warhead design. The GMLRS AW Engineering, Manufacturing and Development team recently also completed all Developmental Test/Operational Test flight tests, demonstrating the full functionality of the LEO design and ability to meet the GMLRS requirements. In addition to its application in the GMLRS, Orbital ATK's LEO technology has been successfully tested on warheads ranging in size from 0.5 to 250 pounds. These warheads include the Small Organic Precision Munition, M1061 mortar round, 155mm unitary cannon cluster munition replacement and the Small Diameter Bomb.

■ New Semi-Automatic Version of the CZ SCORPION EVO 3

(df) The biggest attraction of CZ-USA during this year's shot show was the CZ SCORPION EVO 3 S1 Carbine, a semi-automatic version of the CZ SCORPION EVO 3 A1 machine gun, with a 16" barrel. This

(Photo: CZ-USA)



model will be 90% produced by CZUB and then completed by the CZ-USA subsidiary. The CZ Scorpion EVO 3 S1 Pistol is legally classified by the ATF as a pistol, and is

■ New Training for the Bundeswehr Special Forces Command

(df) The Special Forces Command (KSK) of the German Federal Armed Forces received the mobile version of the small arms trainer Sagittarius Evolution from Thales as a further development of the AGSHP (shooting simulator training equipment for small arms fire/handheld anti-tank fire), which had been introduced within the German Federal Armed Forces. With "Wirkmittel 90 mm" (RGW 90 LRMP) a wireless simulation input device is used for the first time in this shooting simulator. Thus the Thales simulator is ready for use even before the weapons system will be delivered to the troops and allows soldiers of the KSK to train with this new handheld weapon realistically. The mobile system is the smallest version of Sagittarius Evolution. It offers the option of shooting and mission training for up to two trainees simultaneously. The Sagittarius Evolution product family supports both basic shooting training and tactical training, such as, "Judgemental training" for advanced trainees. The networking ability of all versions of the product family allows the training of the cooperation between different teams within complex missions. The now delivered mobile system is installed in hardened rolling containers and features a wireless trainer station on a notebook. Its design permits the system to be set up and made ready by two people within 15 minutes. Other than a room which can be darkened, there are no other infrastructural requirements to take into account. The only requirement is a space of 5 x 3 metres with a room height of min. 2.5 metres.

(Photo: Thales)



intended by CZ-USA to be used as a pistol. Even though it is imported as a pistol, it is a blowback-operated semi-auto in 9mm with a short 7¾" barrel. Equipped with newly designed low-profile sights, its rear sight has four different aperture sizes for everything from close quarters to way out there. The sights ride on an 11" Picatinny rail perfect for mounting optics. The SCORPION has ambidextrous controls, its non-reciprocating charging handle is swappable and reach to the trigger is adjustable.

■ Trials of STORM SHADOW and METEOR from TYPHOON

(df) Further trials of the STORM SHADOW cruise missile and METEOR air-to-air missile have been successfully completed as part of a programme of improvements of



(Photo: Eurofighter)

the Eurofighter TYPHOON combat jet. This new operational release of the STORM SHADOW missile was carried out in the UK Ministry of Defence's Hebrides range in Scotland from the Italian Instrumented Production Aircraft (IPA) 2. The test, which was led by Finmeccanica with the support of Eurofighter, BAE Systems, Airbus Defence and Space, and MBDA, follows the completion of ground trials on the weapon and a successful release of STORM SHADOW in November 2015. This trial was followed by another firing of a METEOR beyond visual range air-to-air missile using UK TYPHOON aircraft IPA6, also at the Hebrides range. Led by BAE Systems with support from MBDA, Selex, QinetiQ and UK Ministry of Defence (MOD) and the Eurofighter teams. The firing follows trials held in late 2015. The STORM SHADOW and METEOR firings are part of the flight test campaign for the Phase 2 Enhancement (P2E) programme which will introduce a range of new and improved long range attack capabilities to Eurofighter TYPHOON.

■ United Arab Emirates Orders Patria AMV

The United Arab Emirates' Armed Forces has ordered Patria AMV 8x8 armoured wheeled vehicles. All details of the contract are classified. "This is a magnificent extension for the ongoing, successful co-operation between the UAE Armed Forces and Patria," said Mika Kari, President of Patria Land business unit. "UAE Armed Forces have been very satisfied with their existing AMV vehicles as they meet all the customer's needs and are suitable for the needed, challenging circumstances. These vehicles will be pro-

duced by our Polish partner in a very tight time schedule. The agreement done now is very significant for Patria, and we are excited about this and looking forward to providing the vehicles." Patria AMV offers effective protection, increased mobility, modularity and combat proven performance. The vehicle's structural solutions enable high payload capacity, high level of protection and integration of heavy weapon systems. It has already been in combat and crisis management operations in Afghanistan and Chad and is under contract for over 1,400 Patria AMV vehicles.



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■ Denmark Orders 309 PIRANHA 5

(df) General Dynamics European Land Systems has signed a contract with the Danish Defence Acquisition and Logistic Organiza-

(Photo: GDELS)



tion (DALO) for the delivery of 309 PIRANHA 5 Armored Personal Carriers (APC) in six variants (Infantry, Command, Ambulance, Engineer, Mortar and Repair), as well as a multi-year sustainment contract for the through life support of the vehicles in the future. The contract has a value of approximately €554 million. Deliveries will be from 2018 to 2023 with the PIRA-

NHA 5 replacing the M113. PIRANHA 5 provides a flexible and comfortable interior and generous payload. In terms of mobility and with its efficient all-wheel drive and the hydro-pneumatic suspension the PIRANHA 5 has a very good performance. The PIRANHA vehicle family has already been in service with the Danish Armed Forces, which has been proven in international operations. Peter Christensen, Minister of Defence of Denmark, said: "It is important that we invest in the Danish Defence. Piranha 5 is better protected than the ageing, armoured personnel carriers available to the army today, so with this purchase we are enhancing the army's ability to carry out its future tasks."

■ New Project on the Integration of RPAS into Common Airspace

(df) The European Defence Agency (EDA) and an industrial consortium led by Airbus Defence and Space launched a new



(Photo: BAE Systems)

project to contribute to the integration of Remotely Piloted Aircraft Systems (RPAS) into common airspace on February 11, 2016. This project follows a contract for the Enhanced RPAS Automation (ERA) project that was signed between the EDA and a multinational industrial consortium in mid-December 2015. The project will support the widespread use of both civil and military RPAS in non-segregated airspace in Europe in general and their integration in airport operations in particular, addressing several capability gaps identified in the European RPAS Steering Group (ERSG) Roadmap for RPAS air traffic insertion. The project will contribute to setting the European standards that will provide the technical grounds for the certification of the Automatic Take-off and Landing, Autotaxi and Automation and Emergency Recovery functionalities, in the frame of the regulatory framework currently being produced. To achieve these goals, technical and procedural solutions will be developed, and demonstrated by simulations and flight trials. Additionally, the project includes the development of draft standards in cooperation with the European Organisation for Civil Aviation Equipment (EUROCAE). The project also relies on active collaboration with other important stakeholders, such as the European Aviation Safety Agency (EASA) and Eurocontrol. "ERA complements the air traffic integration efforts of other related EDA projects, such as MIDCAS (MID-air Collision Avoidance System) covering en-route Detect & Avoid and DESIRE (Demonstration of Satellites enabling the Insertion of RPAS in Europe) covering satellite command and control data links," Roland Van Reybroeck, EDA Director Cooperation Planning & Support explains. "These projects, strongly driven by military requirements, have achieved tangible results but there is a need to proceed with further investments, also in view of establishing dual-use standards and meeting civil regulation requirements."

■ SEAGULL for Anti-Submarine Operations

(df) Elbit Systems released its newest unmanned platform designed for the needs of navies. SEAGULL is a 12-metre Unmanned Surface Vehicle (USV) with replaceable mission modules, with two vessels capable of being operated and controlled in concert using a single Mission Control System (MCS), from manned ships or from the shore. The system provides unmanned end-to-end mine hunting operation tasking, mission planning, and on-line operation in known and unknown areas, including area survey, search, detection, classification, identification, neutralization and verification. It is equipped to search the entire water volume and operate underwater vehicles to identify and neutralize mines. With these capabilities SEAGULL creates a threat to submarines using a cost-effective and available asset, replacing and augmenting manned assets with minimal threat from submarines. It empowers a surface vessel or naval base commander with off-board, rapidly deployable Anti-Submarine Warfare (ASW) capabilities to protect critical sea areas and high-value assets from submarine as well as sea mine threats. The USV features a robust, highly-autonomous and safe sailing capability as well as modular mission payload suites, selected to match a variety of required missions including EW, surface force protection, hydrographical missions in addition to the core MCM and ASW missions. The sailing suite includes a patented Autonomous Navigation System (ANS), with obstacle avoidance, which considers the international regulations for preventing collisions at sea.



(Photo: Elbit)

■ Multimission Unmanned Helicopter

(df) United Instrument Manufacturing Corporation (UIMC) has presented plans for a multifunctional unmanned

flying system, which unites the features of an unmanned helicopter, observational copter, reconnaissance copter, and attack copter with rocket-launching capabilities. The robots can carry out a wide range of tasks and can either act independently or as part of a squadron. "The technology developed by System-prom is designed to effectively replace humans wherever possible. It can carry out reconnaissance, monitoring, and patrolling missions of indoor and outdoor facilities, transport cargo, prepare cartographic materials, and fulfill combat tasks," said Sergey Skokov, Deputy CEO of United Instrument Manufactur-



ing Corporation. According to him, the human role in managing the robots has already been minimized: The drone detachment can operate in an autonomous mode, where each robot performs its function independently, following its own specified route. "These robots can navigate through the air without the support of an operator, choose their own routes, carry out reconnaissance work, and interact with other drones and robotic systems," said Skokov. The unmanned helicopter is designed for conducting video surveillance, delivering a payload to a given destination, and carrying out meteorological observations. It has a flight range of a few hundred kilometers. The reconnaissance copter can fly to an altitude of several thousand meters and can be used to detect and identify targets in realtime. The observational copter can be used to adjust artillery fire and determine the location coordinates using the signals of GLONASS/GPS satellite navigation systems. The attack multicopter can detect and destroy enemy targets, including tanks and armored vehicles, with the help of standard rocket weapons.

American ZUMWALT Destroyer Makes Progress

(df) Raytheon, the prime mission-systems equipment integrator for the US DDG 1000 ZUMWALT-class destroyer



(Photo: Raytheon)

programme, states that the ships have made good progress towards delivery. Raytheon systems performed well during DDG 1000's Alpha Trials, a week-long, at-sea exercise that demonstrated key ship capabilities, including the Total Ship

Computing Environment and engineering control systems, the company stated. TSCE provides all shipboard computing applications, including the combat management system; command, control, communications, computers, and intelligence elements; ship and machinery control systems; damage control; and support system. Recent programme milestones have advanced critical mission systems of the ZUMWALT class. Raytheon's onsite Ship Integration and Test team continues to work in close collaboration with the Navy and the shipyard, supporting ongoing installation, integration and testing in line with construction progress.

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The Future of European Foreign and Security Policy

Federica Mogherini

The call for a more united European foreign and security policy has never been stronger. The growing feeling among our citizens is that Europe today is less secure than it used to be. The conflict areas in our neighbourhood have indeed multiplied.

In addition to that, in an era of borderless threats the distinction between internal and external security is always more blurred. The demand for a more integrated European defence and security policy keeps topping the Eurobarometer surveys, with three out of four citizens endorsing it. Two out of three Europeans ask for a stronger EU foreign policy. Such support cuts across the traditional party

institutions, and a better Union. I believe a broad majority of Europeans understands that the challenges we all face are too big for any of our countries. The future of our foreign and security policy can only be European.

Europe's external action is already much more united than many believe. "EU divided" always makes for a catchy headline, but most often it does not reflect



(Photo: EU)

a unanimous pledge to support France with all means. Such means are now being agreed between France and the other Member States: the procedure is inter-governmental, but the framework is clearly European. And I believe this is a good way to move forward: each of our countries has its own strengths, its own history and resources. What truly matters is that each Member State's tools serve the same cause. I always say that Europe does not necessarily need to speak with one voice: the variety of voices is what makes our ensemble so powerful. But all the voices have to sing the same song.

We are a unique security provider on the global stage. No other world power can mobilise the same variety of foreign policy instruments: diplomatic, development, cooperation tools, and indeed military tools. For this reason, our partners worldwide are realising that the European Union is not just a big free trade area, and they increasingly seek our cooperation on security issues. I do not think that Europe can only rely on its soft power; neither do our partners. We have to understand how to make full use of all our assets, "hard" and "soft", in the most effective and coherent way.

The complexity of the threats we face demands that we mobilise our full set of foreign policy instruments. In Syria and Iraq Da'esh is engaged in a very "traditional" kind of war: it conquers cities, infrastructure, natural resources. At the same time, the terrorist group wages an asymmetric warfare beyond the borders of Syria and

(Photo: dpa)



French police special forces RAID (Research, Assistance, Intervention, Deterrence) and BRI (Research and Intervention Brigades) raid an apartment in Saint Denis, North of Paris, on 18 November 2015, an operation aimed at capturing the suspected mastermind of the Paris attacks

lines and the sometimes overemphasized divide between euro-sceptics and euro-enthusiasts. The current discontent with many of our institutions (not just at the EU level) comes with the plea for better

reality. From the deal with Iran to the support of the Minsk agreements, the European Union stood together in all the most heated crises in our neighbourhood. Of course, unity can never be taken for granted and is never acquired for ever. It needs to be renewed on a daily basis. It calls for a constant work to bring our European cooperation to the next stage. Sadly, our solidarity has been tested again by the terrible attacks in Paris. For the first time ever, a Member State invoked the Treaty on the European Union's Article 42.7. In response to that, there was

Author

Federica Mogherini has been High Representative of the European Union for Foreign Affairs and Security Policy and Vice-President of the European Commission since 1 November 2014.



(Photo: EU)

The Foreign Affairs Council focussed on the situation in Syria, Iraq and the threat from ISIL in Brussels on 14 December 2015.

Iraq, and it targets our youth with their propaganda on the social media. Every threat today is hybrid, and this can be scary. But if there is one world power which has the tools to face such complex threats, it is the European Union.

This does not mean that Europe has all the capabilities it needs. But before we discuss about our assets, we should make sure that we know what we need them for. There is one mistake we cannot afford today: we must not act without a rational strategy, a vision on what we want to achieve, and how we want to get there.

This is what the new European Global Strategy will be about. More than a decade after Javier Solana's European Security Strategy, it was high time for a new reflection on our security environment and on the goals of our external action. The fact that the new strategy will be "global" does not mean it will be less security-focussed: quite the contrary. Security and defence will be integral part of each chapter. For every objective we will identify the defence-related instruments that we need. The value of our work on what we traditionally define as security and defence will be enhanced – not diluted – by being addressed together with other instruments: complementarity is the key. I think we have all moved beyond the old-fashioned dispute between defence and development spending: both our military capabilities and development aid are foreign policy tools, there is no contradiction between the two.

At times, we tend to focus too much on dividing lines and get stuck into artificial divisions that no longer correspond to reality. The same holds true for what is

civilian versus what is military: the reality here is one of "multi-purpose". That lesson seems to have been learned within industry; we need to incorporate that lesson at the EU level, too.

Our European institutions have much to learn from an open dialogue with the whole of Europe's society. So, the defence community at large is being widely consulted on the Global Strategy, together with the EU military staff. The new document could not be drafted behind closed doors. As we discuss the future of Europe's foreign policy, we can only seek for the broadest cooperation from all. I am grateful to "European Security & Defence" for this opportunity to further ad-

dress an audience of defence and security experts. In a way, the process of writing a new strategy is as important as the final outcome: as our politics and policies become more integrated, we need a truly European debate on our Union's priorities and objectives. We need to forge a new European public space, on defence issues as on any other policy.

During the first months of work on the strategy, some have pointed out that we also need something more specific and defence-targeted than a Global Strategy. I perfectly understand this suggestion, and largely agree with it. I took my first steps as an Italian member of parliament inside the Defence committee; back then, I insisted on the need to provide Italy with a White Book on Defence. It took years, but the Italian White Book on defence was finally published just a few months ago – as the readers of this magazine know well. This is my background, and I haven't changed my mind. When the Global Strategy will be ready, it will have to be implemented through more sectorial papers. A specific reflection on Europe's defence will soon be on the agenda.

But right now, we should focus on the current work. These very days, European policy-makers are exposed to opposing pressures on how we engage with our neighbourhood. On the one side, we are asked to "shut the door" of our continent and seek isolation from the rest of the world. The terrorist attacks in Paris are another tragic reminder that isolation is not an option for us.



(Photo: EU)

The High Representative of the European Union for Foreign Affairs and Security Policy, Federica Mogherini, attended the NATO Meeting of Ministers of Foreign Affairs in Brussels on 2 December 2015. After the meeting she talked to the press together with NATO Secretary General Jens Stoltenberg (right).

The traditional boundaries between internal and external policies no longer hold. Turning inwards will only make us more vulnerable, not more protected. If we take this from a different angle, isolation would also mean that we would miss out on the opportunities that our global links offer in terms of trade, human mobility or technology: a more connected world provides us, Europeans, with unprecedented opportunities.

On the opposite side of the debate, some voices are calling for a more aggressive foreign policy, as if our action alone could solve all the world's problems. Recent history should teach us: yes, we must engage with our neighbourhood; but we must also do it responsibly, taking all factors into account, with a rational approach and a rational strategy. Military intervention can never be the only solution; still, the military is and remains a crucial string to our bow. It is a difficult balance to find: it calls for a sense of our limits, but also for a deep reflection on our potential.

A big part of the answer to this question – how should we engage with our neighbourhood? – involves our relationship with our partners. In a world where power is more fragmented and diffuse, global security can only be achieved through a collective effort. So we have a strong interest in pushing forward our common work with NATO, whether it is on political dialogue, on capability development, on addressing new threats or on practical cooperation in theatres where we are both engaged. I am truly grateful to the NATO Secretary General, my friend Jens Stoltenberg, for our excellent cooperation during our common first year of mandate. Such cooperation can only benefit both the EU and NATO, and all our Member States.

At the same time, the European Union also has a strong interest in developing new accords with other regional organisations – think of the African Union – which can take responsibility for the security of their own continent. In the field of our Common Security and Defence Policy, partnerships are among the most effective and dynamic areas. More and more countries want to engage in a dialogue and, better still, to cooperate with us, contributing to our missions and operations.

In our recent past, the ambition alone to take charge of our neighbourhood backfired. Today we can build up new alliances to address the common challenges we face, new alliances in which everyone follows their own interest, to the benefit



(Photo: EU)

General Michail Kostarakos (left) took over his duties as Chairman of the EU Military Committee on 6 November 2015. He succeeded General Patrick de Rousiers (right).

of all. Win-win partnerships are the best way forward in the world of today, in a more cooperative global framework. I would like these concepts – responsible engagement, partnership, and a win-win approach to international affairs – to be at the core of the Global Strategy. Living up to these principles requires adequate tools, including the development of military capabilities and defence spending. I have never been an advocate of the “more with less” school of thought. Of course we must better spend our resources, but we must also spend enough. In June 2015 the European Heads of State and Government called for a sufficient level of expenditure for defence and a more efficient way of using these resources. While budgets in some Member States are on the increase, such increases do not compensate for the decline in recent years.

Just to give one concrete example: investment in defence research has reduced in real terms by almost one-third – minus 29% – over the last few years. Research is crucial for the capabilities of the future. Whilst immediate savings might be accrued by cutting back now, this will cost us in the longer-term by not having the right capabilities when we need them.

For the same reason, we must also support our defence industry, including small and medium enterprises, which are the source of so much technological innovation.

There can be no security without defence, there can be no defence without capabilities, and there can be no capabilities without industry. For this very reason the European Commission has put forward a Defence Action Plan, which we

are now discussing together with Member States. Its aim is to ensure that the European industrial and skills base will be able to deliver the military capability priorities required by Member States.

This process is clearly linked to the Global Strategy. The strategy will provide guidance for the identification of military capability needs, and the means to deliver them with the support of industry. This translation of the Strategy into capability needs will have to be coherent with the Commission's European Defence Action Plan, and vice-versa.

Our European Defence is already changing. The founding fathers of our Union believed defence should be the first step towards European integration. History followed a different path. Still, sixty years after the failure of the European Defence Community we are realising that the security of our Union demands greater integration.

We should not be afraid of looking in very concrete terms at some of the Treaty provisions that do allow for taking defence cooperation within the EU a step further. Working for Europe's foreign and defence policy should not have much to do with ideology: the quarrel between euro-sceptics and euro-philes can only lead us so far. All Member States will be better off with a stronger European security and defence. In a more connected world, with harder budget constraints, European cooperation can best serve national interests.

Our citizens ask for a better Union, one that can better serve their interests and guarantee their security. It is time to listen to their voice, and translate it into policies for our common future. ■

United Kingdom Strategic Defence & Security Review 2015

Conrad Waters

The United Kingdom published its long-awaited Strategic Defence & Security Review 2015 (SDSR 2015) on 23 November 2015. The review makes a balanced attempt to prioritise the state's resources to counter the greatest risks posed to national security over the next five years. The British Armed Forces have faced an almost uninterrupted series of reductions in equipment and personnel since the end of the Cold War. However, SDSR 2015 heralds modest increases in force numbers and capabilities.

SDSR 2015 was announced five years after the last major defence and security review, SDSR 2010. Initiated by the then new Coalition government led by Prime Minister David Cameron, SDSR 2010 took place against a backdrop of financial austerity. These financial pressures were exacer-

operations in Afghanistan until the end of 2014. These were placing a heavy burden on all branches of the armed forces. The end result was a series of cost-saving measures, many not altogether compatible with broader strategic aims. Amongst the more controversial were decisions to

scrap the NIMROD MRA4 maritime patrol aircraft (MPA) programme and to take a ten-year "holiday" from fixed-wing aircraft carrier operations. The latter saw the rapid withdrawal of the Royal Navy's flagship ARK ROYAL and the force of HARRIER "jump jets". There were also big reductions to other equipment across the three armed services. Trained full-time personnel were to fall by 17,000 to 158,000 – a cut of some 10% – by 2015. Due to the ongoing demands of the land campaign in Afghanistan, cuts in manpower fell disproportionately on the Royal Air Force and the Royal Navy.

Some of these decisions began to look poorly-judged after only a few months. For example, intervention in Libya's civil war from March 2011 onwards illustrated the limits to the United Kingdom's (UK's) expeditionary capabilities without a fully-functioning aircraft carrier. Equally, tensions with Russia and renewed activity by its submarines quickly demonstrated the vulnerabilities of British territorial waters in the absence of a MPA capability. Conversely, it became clear that planned army manpower was unaffordable given the approximately 8% real-terms fall in defence spending envisaged between 2010



(Photo: Georgina Coupe/Crown Copyright 2015)

British Prime Minister David Cameron examining a TYPHOON jet at RAF Northolt in London on 23 November 2015, the day SDSR 2015 was announced. SDSR 2015 is the second defence and security review announced by Mr Cameron; it has been more positively received than the first.

bated by a future procurement programme that was not fully funded. Consequently, although SDSR 2010 was accompanied by a new National Security Strategy, the decisions it made were driven largely by the need to save money. An added complication was the commitment to combat

A prototype NIMROD MRA4 aircraft pictured in 2010. Scrapping the programme and ending the UK's MPA capability was one of the more controversial decisions of SDSR 2010.



(Photo: Ronnie MacDonald under Creative Commons 2.0)

Author

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Changing British Armed Forces Personnel Targets

(Numbers of trained, regular personnel)

Benchmark	Actual	SDSR 2010 (Original)	SDSR 2010 (Original)	SDSR 2010 (2011/2 Revision)	SDSR 2010 (2011/2 Revision)	Actual	SDSR 2015
Date	2010	Plan 2015	Plan 2020	Plan 2015	Plan 2020	2015	Plan 2020
British Army	102,000	95,000	94,000	82,000	82,000	80,400	82,000
Royal Air Force	38,000	33,000	31,500	33,000	31,500	31,250	31,750
Royal Navy	35,000	30,000	29,000	30,000	29,000	29,700	30,450
Total	175,000	158,000	154,500	145,000	142,500	141,350	144,200

Note: Table excludes trained reservists, the numbers of which will be substantially increased under 2011/12 plans. The intention is to grow these from 26,000 (of which 22,000 are Army Reserve) to 35,000 (of which 30,000 are Army Reserve) by 2020.

and 2015. Ultimately, the reduction in the number of regular soldiers was revised from 7,000 to around 20,000. This was to be partly counterbalanced by higher numbers of reservists.

Despite these criticisms, some of the broader decisions taken around the time of SDSR 2010 were positive in creating a coherent security architecture from which to determine future strategic choices. The formation of a National Security Council and the creation of a National Security Strategy are noteworthy in this regard. These provided a framework from which to develop the more cohesive and, hopefully, enduring approach represented by SDSR 2015. The greater internal threat from ISIL-backed terrorism combined with the external challenge posed by a more assertive Russia mean this 'joined-up' approach is essential to meet higher risk levels at a time when resources remain constrained.

SDSR 2015 Overview

Although SDSR 2015 was also conducted under David Cameron's leadership, it is the product of the new Conservative government elected in May 2015. The new administration had already made commitments to grow defence spending (£34.4bn in 2014/15) by 0.5% above inflation each year until 2020/21 and to allocate at least 2% of national income to defence. This backdrop meant the savings-based agenda of SDSR 2010 has not been repeated.

SDSR 2015 also differs from its predecessor in that previously separate National Security Strategy and Strategic Defence and Security Review documents have been combined. This in itself underscores the greater coherence inherent in the new approach. The resulting National Security Strategy and Strategic Defence and Security Review 2015: A Secure and Prosper-

ous United Kingdom (Cm 9161) sets an overall vision "for a secure and prosperous United Kingdom, with global reach and influence". The National Security Strategy underpinning this vision emphasises both the role of hard power – such as that provided by the armed forces and intelligence agencies – and that of soft power – for example, that wielded by the diplomatic service and institutions like the BBC World Service. In line with this approach, the longstanding commitment to devote 0.7% of Gross National Income to overseas development is accorded equal prominence to the renewed undertaking to spend 2% of Gross Domestic Product on defence. At least half the aid budget will be used to support fragile states.

The updated National Security Strategy sets three high level objectives by which the overall strategy will be delivered. These are stated as being:

To protect our people: The defence of the UK, its overseas territories and economic interests by investment in the armed forces and wider security services, as well as through cooperation with allies.

To project our global influence: Reducing the risk of threats affecting the UK and its allies through the use of overseas aid, cultural influence and alliances to build stability and strengthen a rules-based international order.

To promote our prosperity: Through support of open international trade and the advancement of the UK's defence and security sectors.

The review goes into much detail as to how the defence and security services will achieve these objectives in an environment where risks are increasing. This is not simply because of traditional terrorist or state-based threats but also due to the growth of dangers posed by, for example, cyber-attacks, organised crime and migration. As such, many of SDSR 2015's significant announcements do not directly

relate to the armed forces. These include a near 2,000 or 15% uplift in personnel in the intelligence agencies. There will also be substantial growth in amounts spent on cyber security.

So far as the armed services are concerned, SDSR 2015 states trained personnel will amount to some 144,000 in 2020. This is a slight rise on previous plans but civilian support staff numbers will continue to fall. The better financial backdrop will allow equipment spending over the decade to grow by about £12bn to £178bn. Much of this will be allocated to renewing the submarines carrying the TRIDENT-based nuclear deterrent. This will now cost £31bn (plus a £10bn contingency) over the life of a 20-year programme. The review leaves much of the renewal project unchanged but suggests that the first submarine will not be delivered until the early 2030s. This is later than previously envisaged and will put a strain on the existing, ageing boats. The nuclear deterrent forms part of a new Joint Force 2025 vision. This expands the more limited Future Force 2020 structure established by SDSR 2010. The main change is an ability to deploy a larger force more quickly. Specifically, Joint Force 2025 envisages up to 50,000 personnel including a maritime task group centred on a QUEEN ELIZABETH class aircraft carrier; a land division of three brigades; an air group of combat, transport and surveillance aircraft; and a Special Forces task group being employed in an expeditionary operation. This compares with the force of 30,000 previously envisaged.

The major equipment announcements made in SDSR 2015 focus on making good some of the larger capability gaps created by the 2010 review. The Special Forces will benefit from additional investment in a rather vague list of equipment. The most important developments impacting the three armed forces are discussed further below.

The British Army

SDSR 2015 confirms previous plans for a British Army in 2020 comprising 82,000 regular soldiers and 30,000 reservists. The Army 2020 structure, first announced in 2012, reorganised land force capabilities around a “high readiness” Reaction Force of three multi-role, armoured brigades in 3 (UK) Division and the separate 16 Air Assault Brigade. A further seven infantry brigades in 1 (UK) Division were to form a lower readiness Adaptable Force used to support tasks such as standing commitments in the overseas territories, military training abroad and follow-on forces for lengthy expeditionary commitments. SDSR 2015 largely maintains this structure but revises the Reaction Force by creating two new “Strike Brigades”. These will be formed from an existing armoured brigade and one of the Adaptable Force’s infantry brigades. As such, the Reaction Force will increase in overall size. Little detail has been released on the likely composition of the new Strike Brigades; how they will fit into the overall picture is a major unanswered question. However, the desire to be able to deploy an army expeditionary force of divisional strength is clearly one of SDSR 2015’s key objectives.

The need to adapt to new threats is evidenced by a commitment to create two “innovative” brigades comprising a mix of regular and reserve personnel to improve battlefield intelligence and “hybrid warfare”. In contrast to the other two services, little is said about new equipment but previously planned upgrades to aircraft and armoured vehicles are confirmed.

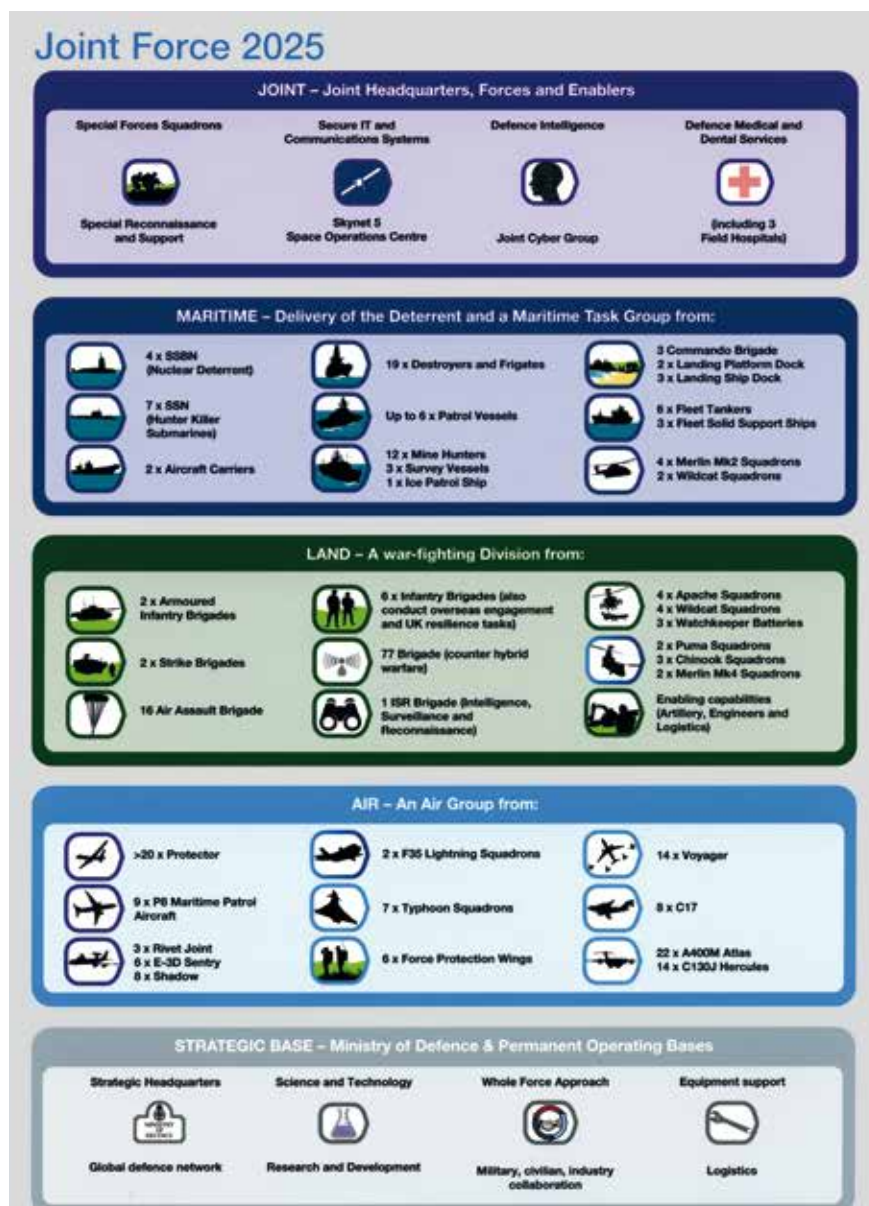
The Royal Air Force (RAF)

Although inter-service distinctions are something of a distraction given the increasing focus on joint capabilities, the RAF was generally seen as the “winner” from SDSR 2015’s main decisions. Specifically: A decline in combat air power will be reversed: Falling RAF fast jet numbers were becoming a major concern. An already depleted front-line force of five TYPHOON and three TORNADO squadrons was due to decline further with the retirement of the last TORNADO by 2019. This will now be balanced by the creation of two new TYPHOON squadrons, probably by retaining older, Tranche 1 aircraft. F-35B LIGHTNING II purchases will be accelerated to provide an additional squadron by 2025. This will give a front-line combat force of seven TYPHOON and two LIGHTNING II squadrons under Joint Force 2025. SDSR 2015 also extends the TYPHOON’s planned lifespan to “at least 2040” and re-affirms a pre-



(Photo: Crown Copyright 2013)

A CHALLENGER II tank manned by reservists of the Royal Wessex Yeomanry pictured on a live fire exercise. SDSR 2015 confirms plans to use part time reserve soldiers for a bigger part of the army’s manpower.



(Photo: Crown Copyright 2013)

A graphic showing the main future constituents of the British Armed Forces, from which Joint Force 2025 will be drawn.



An image of a new AJAX armoured fighting vehicle. These will be one component of two planned new Strike Brigades, other details of which remain sketchy.

capacity to absorb the increased equipment now envisaged.

The Royal Navy (RN)

SDSR 2015 was largely positive for the RN despite some disappointments. In particular, a headline increase in personnel of about 450 was less than requested. However, previous plans envisaged a further fall in numbers and trained headcount in 2020 should now be around 1,500 more than allowed by SDSR 2010. This supports the following decisions:

Both QUEEN ELIZABETH class carriers will enter service to ensure one is continuously available: This confirms an announcement in 2014 that overturned SDSR 2010's plan for one to be held in reserve and possibly sold. The acceleration in F-35 purchases will permit a larger complement of fast jets to be embarked in the early 2020s than previously envisaged.

New support ships will be ordered: The lack of modern stores support ships to sustain carrier operations was a potential

problem. Three ships will now be built by 2025 to supplement four replenishment tankers that have already been ordered.

Acquisitions of new warships will be revised: Planned orders for 13 Type 26 frigates will fall to eight, reflecting higher than expected costs. Orders will be deferred by a year to allow an acceptable deal to be hammered out with builder BAE Systems. In the longer term, frigate numbers will – at the least – be maintained by construction of a new, lighter frigate class.

Additional offshore patrol vessels will be built: Two more vessels will be added to an existing order for three ships to maintain production in the yards on the River Clyde. These will contribute to an increased total of 'up to' six patrol ships in 2025.

A new national shipbuilding strategy will be published during 2016 to ensure the sector can meet future defence needs. Work will also continue to investigate the six Type 45 destroyers' potential in the ballistic missile defence (BMD) role, alongside the construction of a land-based BMD radar.

Conclusions

SDSR 2015 is a welcome development for British security and defence policy. It has provided a coherent assessment of the major threats faced by the UK and sets out a considered plan as to how best to organise the state's combined resources to mitigate these risks. From a practical perspective, some additional resources have been found to make good the worst of the deficiencies created by the previous, cost-driven defence review and to invest in new capabilities.

Nevertheless, considerable challenges remain. SDSR 2010 left Britain's armed forces in a depleted state and ongoing financial restraint means it will be some years before the enhancements now envisaged take effect. More broadly, the greater cohesion between different government arms in support of security policy that underlies SDSR 2015 is also work in progress. Given the fast-changing security environment, a sense of urgency will be needed if SDSR 2015's objectives are to be achieved. ■

(Photo: BAE Systems)



SDSR 2015 plans to retain Eurofighter TYPHOON jets in service longer whilst accelerating purchases of F-35B LIGHTNING II Joint Strike Fighters to reverse falling RAF fast jet numbers.

by retaining 14 C-130J HERCULES alongside the newer C-17 and A400M ATLAS types. The smaller HERCULES is more flexible in the Special Forces insertion role.

The size of the UAV force will grow: More than 20 upgraded REAPER aircraft – to be named PROTECTOR in British service – will replace the existing ten earlier variant REAPERS. Interestingly, RAF personnel will only grow by some 250 over previous plans. This suggests the availability of some surplus



A computer generated image of a Type 26 frigate. Fewer of these will be built than previously planned but a new light frigate will be designed.

(Photo: BAE Systems)

Viewpoint from Ankara



Cengizhan Çatal

Hard Problems to be Solved

The elections in the Turkish Republic on 1 November 2015 had a clear result. The Justice and Development Party (AKP) increased its votes and power compared with the elections of 7 June 2015. And AKP re-gained the government majority with 49.2 percent. In contrast to the June elections the three opposition parties (CHP, MHP, HDP) lost large amounts of votes.

The new Turkish government and all public service organisations – above all the Turkish Armed Forces – are facing growing security threats in the region. A Russian Su-24 combat aircraft was downed by a Turkish F-16 near the Syrian border in the morning of 24 November 2015. According to Turkey, the aircraft – the nationality of which had not been identified at the time – was engaged while operating in Turkish airspace up to a depth of 1.3 miles for about 17 seconds after being warned to change its heading 10 times over a period of five minutes. According to official statements from Russia, however, the Su-24 was over Syrian territory, 0.6 miles south of the Turkish-Syrian border, when it was hit. The issue constitutes the first engagement of a Russian combat aircraft by a NATO country since NATO's foundation in 1949. As a result, Russia has started to impose sanctions on some Turkish products and services. Moscow has suspended a visa-free travel agreement with Turkey and banned charter flights between the two countries. Some Turkish diplomats and military experts say that tourism and energy are not the major worries for the time being. This is perhaps the first military engagement between Turkey and Russia since World War I. These experts say that Russia is planning more significant measures. Russia will likely attempt to harm Turkey's political and strategic interests in regions where the two countries' interests clash.

On the other hand the shooting down of a Russian jet by Turkish fighters was a good pretext for Russia's military presence in Syria and the region. Russia deployed S-400 air defence systems to Syria. The radars of Russia's most advanced long-range air defence system have an even longer range than the missiles and can provide a detailed picture of the wider airspace. For example, they can monitor coalition air operations and can keep a close track on the Turkish Air Force's operations.

At the same time a new diplomatic crisis arose between Iraq and Turkey. Iraqi officials stated that Turkey had 48 hours to withdraw a Turkish military contingent deployed near the ISIL stronghold of Mosul without the consent of the Baghdad government. Turkish officials responded that the troops were sent to guard a training camp for Iraqi Sunni volunteers stationed in Bashiqa, near Mosul. The volunteers underwent training to re-conquer the city from the ISIL group. Ankara also claims that Turkish troops are in Iraq at the request of Haider al-Abadi, Iraq's Prime Minister.

Looking at the situation from a wider angle one may conclude that the only actor which can take advantage from a Russian-Turkish-Iraqi crisis is ISIL. Only ISIL may turn out as a winner from Turkey's crises with Russia or Iraq. And the crisis between Turkey and Russia cannot continue forever. This should be realised by all regional actors and military powers and the focus should be on the fight against ISIL.

Turkey cancelled a long-range missile defence system tender which was awarded to China. This was a very important matter for Turkey's national security policy. Government officials announced that they preferred the Chinese offer due to its potential for co-production in Turkey. However, NATO raised objections to Turkey's move, pointing out that missile systems used by members of the transatlantic military alliance must be compatible. NATO insists that the Chinese technology is not compatible with the evolving missile shield being built in Europe. After the cancellation Ankara is now planning to launch its own long-range missile defence project. Also, the questions remain as to how Turkey will meet its long-range air defence needs. The question is about whether "national resources" capabilities may suffice for this huge strategic project. This requirement could provide the basis for a cooperative venture between Turkey and European and US companies in the near future. Due to the rising security risks in the region Turkey's requirement for such a system is imminent.

Turkey needs strong solutions for hard regional problems. 2016 is likely to bring about numerous challenges for Turkish security and political decision-makers.

“Such expensive ultra-precision is often not needed at all...”

Characteristics and Results of a “Different” Russian Air Campaign over Syria

Georg Mader

The contingent or “Aviagroup” of the Russian Federation’s Air and Space Forces (formed in August last year by the merger of the former Russian Air Force (VVS) and former Russian Aerospace Defence Forces (VKO) and now abbreviated as VKS or BKC) has indiscriminately struck various anti-Assad militant groups in the war-torn and exile-drained country. From the beginning, more bombing occurred against what the West used to call “moderate” nationalists and less against what we name as the true Islamists or Daesh. As the author has experienced, for the Russian military leadership the West’s differentiation is rather strange: terrorists are terrorists. Following that approach, for Russia the air campaign is rather “simple” – while an often brutal aggravation for “the West”...

Seen from the perspective of the Assad government, as the sole beneficiary, Russia’s immediate objective in Syria – to shore up the Assad government’s position and save it from military defeat at the hands of the Sunni rebels – has largely been achieved. Momentum has shifted back in favour of government forces, which are stabilising front lines in areas that are core to the government’s survival, while making slow but steady progress as the initially poor coordination between VKS, Hezbollah fighters, Quds-led Iranians and the Syrian Army appears to be improving. With rolling Russian military support – not only from above but also with T-90 MBTs or troops of the 45th SPETSNAZ Brigade, like at Qamishli – the Syrian government expanded its controlled territory by 1.3% between 29 September 2015 and 11 January 2016, according to the latest IHS Conflict Monitor. All of these government net gains were achieved against Sunni rebels (590 km² gained between Aleppo and Idlib as opposed to 205 km² lost), whereas the government suffered an overall net loss of 5 km² to the Islamic State (205 km² gained vs 210 km² lost). This clearly represents a turnaround in the government’s position, considering it lost 18% of its territory in the

first eight months of 2015 and was edging towards the loss of Aleppo; and with the intensified rebel attacks against its Alawite heartland in Latakia province. The so-called “northern Homs offensive” geared towards clearing territory controlled by the Islamist rebels in the Al-Rastan Plains, confirms the Syrian Army’s usage of the latest

tended to remain close to zero. Not that for the US-led coalition – “deconflicted” from the Russians – bombing Daesh in Syria (and Iraq) would not have spawned their own collateral issues. But these overwhelmingly happen because of bad pre-strike intelligence and coordination errors and not because of simply “dumb” and



(Photo: RusSTV)

Russian Su-24 dropping “dumb” OFAB bombs

military tactics devised by Russian military advisors. Similar to both the northern Latakia and eastern Aleppo fronts, the tactic is to continuously shift axes in order to confuse and exhaust enemy forces.

Controversial Methods ...

From US or NATO viewpoints, broader operational use of unguided ordnance has

old freefall weapons such as those widely used by the Russian contingent. In fact most of the sorties flown by the VKS over Syria have involved the use of unguided FAB-250 and FAB-500 ordnance and – multiple times confirmed, sadly – have even dropped RBK-500 cluster bombs and their SPBE sub-munitions. Many locals and colleagues were transmitting images of the consequences out of Syria every day,

Author

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

up to the very day of the Geneva talks in early February.

During the Dubai Air Show in November 2015 the author discussed the Russian air campaign's results and footprint with two USAF officers from AFCENT, under condition of anonymity. According to what they claim to have analysed, about 70% of the 5,000+ air strikes carried out by Russia since it began its air offensive in Syria on 30 September, hit an often illogical pattern of more stationary targets than a "Close Air Support-style" effort against moving targets. But the latter were "any" rebels opposed to Bashar al-Assad, rather than supporting the efforts of the US-led coalition against ISIS, to which Mr. Lavrov always seems willing and what they then did for some weeks after a lot of public condemnation. "We are however still not convinced of what militarily 'pure' Russian intentions are. That the Russian strikes are not precise causes me great concern, because I think in the considerable urban destruction, there is an(other) indirect correlation to your refugee flow to Europe..."

A Different, a "Russian" Approach ...

Serving pilots and several older aerospace colleagues share the opinion that Russian pilots could not be more accurate in their attacks, even if they wanted to. While the US and its allies have invested billions of dollars in PGMs and the aerial sensors to guide them, Russia has – obviously at least since Georgia in 2008 – continued to stick to typical Russian COIN-strategy and tactics of "pacifying" everything through "kinetic solutions" and to rely on mostly unguided weapons for air-to-ground attacks. Moscow-based think-tank, the Centre for Analysis of Strategies and Tactics (CAST), has criticized the Russian government for its "strange and unacceptable failure" to develop and build enough satellite-guided bombs and new long-range precision air-to-ground missiles, plus the targeting systems to direct them. "VKS bombers and tactical fighters rely on air-to-surface targeting methods that are 30 years old," Alexander Mladenov, a respected Bulgarian Russian aviation-expert, pointed out in a 2015 issue of COMBAT AIRCRAFT magazine. He also pointed to a shelf-life expiry issue as on some sorties, almost half of the Russian bombs or submunitions fail to explode.

On the contrary, Russia's MoD and general-staff have in fact been keen to talk-up and praise the precision-strike capabilities of the GLONASS-guided KAB-500S-E and larger -1500. Yes, they were – at least initially –



(Photo: RusSTV)

Russian Su-34 dropping GLONASS-guided KAB-500S

available and have been successfully used in precise hits when deployed by the impressive Su-34 strikers. But these aircraft have subsequently been frequently seen loaded with 4 to 6 "dumb" bombs – even bombs with dented casings. It really seems that most of the undoubtedly modern air-to-ground ordnance of the X- (Kh-) series that one sees at the booth of TMC (renowned missile-makers merged into 'Tactical Missile Corporation') at MAKS in Zhukovskiy have not reached VKS bases or units in numbers. Or they are simply not produced in numbers equivalent to a Raytheon output or the recent FMS shopping list for KSA and UAE, with numbers close to 10,000. Also – for Russian considerations, they may be just too expensive. Confirmation of such an approach was recently given at Bahrain by ROSOBORONEXPORT manager Nikolai Ruban. Questioned on the ordnance matter, he simply responded: "No, these weapons are there if needed and requested by the local military commander. But such expensive ultra-precision often is not needed at all, against such 'cheap' targets like these terrorists and Islamist thugs and their Toyotas..."

As UNSCR 2245 makes clear, the targeting of civilians and any indiscriminate use of weapons, including through shelling and aerial bombardment, is unacceptable. This resolution was unanimously adopted, including by Russia. When the British Ambassador and Permanent Representative of the UK Mission to the UN in New York invoked UNSCR 2245 and alleged that there have been repeated and well-documented reports of Russian and Syrian regime bombing raids resulting in extensive civilian losses, Russian permanent UN representative Vitaly Churkin responded: "We reject various allegations in connection with Russian actions in Syria. It is especially strange when they are spread by members of the Western coalition, which in contrast to the Russian Aerospace Forces, acts completely

without transparency and inefficiently. Let me point to traditional disregard of numerous civilian casualties caused by US and UK airstrikes in Syria, Iraq, Libya and Afghanistan. The Russian side continues to provide requested military assistance in combating ISIL or Daesh and other terrorist groups. For the first time, they are stopped, they have lost their footholds..."

"Playing" with NATO ...

While some Russian colleagues reminded the author not to forget that the missions flown from Latakia/Hmeymim – with big PR – are also a "fashion show" for the latest Russian military-aircraft and a domestically-targeted sign of national pride, the two USAF personnel based in the region are surely more interested in the modern Russian equipment signatures placed "at their doorstep". This would include the S-300 aboard the cruiser MOSKVA, the S-400 TRIUMF or the sophisticated ground-based EW-system KRASUKHA-4 at Hmeymim, the latter a mobile electronic disruption system designed to jam low-earth-orbit satellites and airborne surveillance radars, at distances of up to 300 kilometres. Into the fabric of military planning, the Russian General Staff has obviously woven a number of interrelated themes of experimentation. These include the use of network-centric platforms, the mentioned EW systems and rehearsing and refining targeting and tactics. KRASUKHA being deployed in Syria suggests they want to conduct some of these experiments with NATO's "lights switched off" in jamming Western high-tech assets that can conduct surveillance of VKS operations. In this sense, from a military perspective, the choice of KALIBR SLCMs to attack undisclosed targets in Syria may have been aimed partly as a test of whether the US or NATO could be caught off-guard by

Masthead

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transnational launches from the Caspian Sea and long-range bombing missions launched directly from Russia – the latter just in January 2016, with Tu-22M3s dropping 10 to 12 unguided FAB-bombs into the overcast sky over Dayr az-Zawr province in almost carpet-bombing style. There are also no armed MQ-9 UAV equivalents in VKS service. But nevertheless, as explained above, the results are in President Assad's favour in the end...

The Fatal Shootdown ...

To a significant extent, equipment obsolescence is responsible for the downing of the VKS' Su-24M on November 24 of 2015 by a CAP of Turkish F-16s. At Bahrain in January the Russian VKS Deputy Commander, Lt. Gen. Dronov, confirmed in conversation that he was in Turkey on October 15th, when it was agreed that any Russian mission to be flown along the Turkish border would be announced 12 hours in advance and a communications hot-line would be established to be used by Turkish GCI officers to warn the Russians in case of a possible border violation developing on the screens. This was necessary because the radio sets in the 1980s Su-24Ms and Su-25s – by November 70% of VKS aircraft deployed in Syria were 30+ years old – are not able to tune in to the globally-established emergency frequencies of 121.5 MHz (civil) or 243 MHz (military). The R-862 model VHF radio installed on the Su-24M requires an optional add-on receiver-module in order to receive emergency channel transmissions in the ultra-high frequency (UHF) and very high frequency (VHF) bands. Their own transponder signals, on the other hand, are "Russian only" and – as we know from the Baltics – cannot be read by Western (NATO) systems. And as the final nail in the coffin of the unfortunate (and helpless) FENCER crew, the rather primitive navigation/attack system of the Su-24M requires the aircraft to maintain a straight-line course for some minutes before releasing bombs to secure a serious CEP. Therefore they could not alter their final, relatively slow, 390 km/h target-run – and they could not hear any of the 10 warnings the Turkish are said to have sent. Also questionable is their RWR/self-defence complex in not warning them when "painted" hostile. The subsequent killing of the pilot, Lt. Col. Oleg Peshkov, while descending on his parachute by the Turkish citizen named Alparslan Çelik (according to 'Hurriyet' Daily News) of course is a war crime. But as no agreed contact was established with the Russian controllers, it is highly likely that the Turkish GCI and the CAP pilots were expecting a Syrian AF aircraft, with the "Assadists" flying Su-24s too...

A similar but much less dramatic incident occurred on January 29th, when according to a Turkish allegation, a VKS Su-34 – the only such type in the region – would have crossed into Turkish airspace and was reportedly warned in Russian and English. While we do not yet know if the Su-34's more modern communications suite now can receive those two frequencies mentioned, Ankara – of course a player now battling with Russia for regional areas of influence – has called in the Russian ambassador. The Russian MoD calls it "propaganda and nonsense, as no Turkish radar can identify any aircraft type or its nationality...". What about IFF interrogation, signature-based threat-libraries and, nowadays, too well-known mission-patterns? Or was there an AWACS involved...?

The battle in and over Syria is not so much about what is technically possible – but much more about what we all believe. Meanwhile the utmost urgent condition delivered prior to the Geneva peace talks by the Syrian opposition on January 31st was an "immediate end of Russian airstrikes against the Syrian people..." ■

On Austrian Security and Defence Policy

Gerald Karner

The security and defence policy of the Austrian 2nd Republic is in some regards a paradox, and in any case unique at least in Europe.

On the one hand the country feels committed to “permanent neutrality” after the Swiss pattern. This internationally-recognised legal status demands particular defensive characteristics – “coping with all threats” – to show a calculable factor in the security-political sphere – marked during the cold war by a dangerously fragile balance of two highly prepared alliances. Not being embedded in any alliance, Austria in theory could decide with complete sovereignty how it organises its security and defence policy, restricted only by international law on the status of neutrality. Therefore the difficult underlying basic conditions of the development of the Austrian Federal Army since 1955 are all the more surprising, considering that the geostrategic situation of Austria was substantially more threatened in the immediate environment of the big cold war alliances than was the Swiss situation, for instance. Unlike Sweden, which since the end of the cold war has also declared itself to be “non-allied”, Austria has never officially given up its neutral status, not even when it joined the European Union (EU) as a full member, although the treaties of Maastricht and Lisbon were completely adopted. Still, it is wrong to think that an isolationist character would form the basis of this behaviour: about 30 years before Switzerland (which still has



Photo: Bundesheer

Nearly 90,000 Austrian soldiers have taken part in more than 50 international peace-support and humanitarian UN missions.

difficulties every now and then with multinational contributions) and also before Germany, Austria started to involve herself in multinational UN operations. Since that time nearly 90,000 Austrian soldiers have taken part in more than 50 international peace-supporting and humanitarian missions, some of them losing their lives in the service of peace. Austria is still one of the biggest contributors to the UN in per capita terms.

In the year after its foundation, the chronically underfinanced federal army successfully undertook its first mission to protect Austria's borders on the occasion of the Soviet invasion of Hungary in 1956. In 1968, with the invasion of the Warsaw Pact into Czechoslovakia, the federal army built up a defensive position; and in 1991, with the violent break-up of Yugoslavia, it was ordered into position to defend the southern border of Austria – challenges which states comparable to Austria in security policy terms, like Switzerland or Sweden, had never faced since the end of WW2. Unlike in Germany, internal operations in Austria – whether for aid after natural

disasters or assistance to the civil authorities – are not particularly discussed within Austria. In addition, the federal army was employed from 1991 for about 15 years on the Austrian eastern border (from 1995 the Schengen border) in assistance to the civilian authorities to prevent illegal migration. What are the reasons for these apparently paradoxical relations? How has Austrian security and defence policy developed in the tense field of objective and varying challenges and the relative disregard of this part of “politics” by the consecutive Federal Governments? And, above all, what is to be expected in future from Austria and its security and defence policy?

Bases and Reasons

The State Treaty of 1955, with which the country regained its sovereignty after WW2, and the constitutional neutrality law are the most important foundations of the security and defence policy of the 2nd Republic until today. On the one hand, it was clear that the demand for preservation of national sovereignty as well as specific

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international law caused the build-up of Austria's own, efficient armed forces. On the other hand, it became evident very soon that important building blocks for the development of a federal army to meet the challenges were absent. Besides, politicians failed glaringly to explain the importance of an effective military national defence to the population: in view of the superior threat massive domestic defensive efforts were considered to be superfluous and the signatures of the Allies on the state treaty were considered to be a guarantee of sovereignty – a mistake, as one knows since publication of Warsaw Pact plans. Since its foundation, the federal army has been the target of criticism by politicians, by the public and by the media.

of human resources within the federal army is insufficient, in principle, until today. Politicians – under pressure from the public officials' union – have never managed to resolve the problems resulting from ageing and more and more expensive staff, who are not employable with the troops any more.

Above all, the absence of an effective air defence capability challenged Austria's sovereignty. Behind closed doors (in some places also a little bit embarrassed) Austrians trusted in the fact that in the case of a Warsaw Pact attack the air defence at least would be taken over by NATO anyway (this revealed a strange understanding of "neutrality"), the catchphrase of "fare dodger" developed at home – and abroad

developed, whose core pieces were called "key zones" arising out of a military appreciation of likely enemy mechanised routes of advance and consequently favourable defensive positions. Key zones were prepared in peacetime with stationary defensive arrangements and would be reinforced before the offensive by mobilized troops of the federal army. The operational delay would be achieved not by engaging in mobile battles, but by forcing the enemy to attack against heavily-defended areas. To preserve Austria as an internationally-recognised entity, continuation of resistance in addition to the main operational lines was further planned, following a break-through in these key zones by the main enemy forces. Besides the delaying effect this tactic was also expected to have a preventive effect, convincing the potential enemy not to attack on the basis of a cost-benefit analysis.

This concept finally corresponded with the objective challenges of the strategic sphere as well as with the country's own possibilities at this time.

At the end of the cold war the classic military threat to Austria started to dwindle. Nevertheless, in 1991 the federal army faced a serious test of its operational capabilities with the violent break-up of Yugoslavia, when it was deployed in defence of the southern border, after the conflict threatened to spread from today's Slovenia into Austrian territory.

EU Membership and the Consequences

Austria's accession to the European Union (EU) in 1995 as a full member in terms of security policy was significant for the country. Although Austria fully supported the treaties of Maastricht and Lisbon, one hesitated to carry through the serious security-political consequences into political conclusions for the development of the armed forces: serious political discussion hardly ever took place about the role of Austria in the creation of a common European Security and Defence Policy or the consequences of the Lisbon Treaty, in which mutual assistance in case of an armed attack on a member state is an obligation.

When, during the wave of accessions by the countries of Central and Eastern Europe to NATO, Federal Chancellor Wolfgang Schäussel began to think about dropping the status of neutrality (and probably also about possible NATO accession), the vehement reaction of the opposition and parts of the media led to a sudden closing of this option. Neutrality had become an essential part of the Austrian identity.

Photo: ÖVP



Austria joined the European Union in 1995. At this time Federal Chancellor Wolfgang Schäussel (left) began to think about dropping the status of neutrality and probably joining NATO as well.

The result of these criticisms was political neglect, and as a result a constant financial shortfall for the armed forces. In the beginning the fact that the majority of its heavy weapons had been left to the federal army by the departing Allied Forces led to reduced investment demands: but at the same time it led to the fact that the Austrian defence budget never showed the high level of investment that has been normal in other countries for decades. In the light of the experience of many Austrian politicians at that time – with the professional army of the 1st Republic and its employment in the civil-war-like riots in 1934 – it was clearly necessary to build up the federal army using the system of mandatory military service, and that the status of employed cadre staff should be as civil public servants. As a result of these decisions, the development

– increasingly as a synonym for the country's security-political behaviour. Neutrality was characterised as part of Austria's identity, to which Austria owes her security and safety, but her core piece – armed defence – was terribly neglected. Despite that, and owing to the efforts of some military leaders, the Austrian defence system during the cold war was built up more and more seriously. The federal army would have to delay the offensive of one pact system against the other at least for a certain number of days to prevent a battle of both adversaries on Austrian soil, as well as to win time for the attacked party to build up its own defensive disposition. In principle, this consideration should be seen as the basis of Austrian defensive planning up to the end of the cold war. Over decades, a complex defensive system was



Photo: Personenkomitee "Unser Heer"

Despite a powerful campaign in favour of changing to a professional service a majority of the Austrians opted in a consultative referendum on 20 January 2013 to keep the mandatory military service.

Nevertheless it was evident that the fundament of Austrian security and defence policy urgently needed updating. The contradiction between neutrality and solidarity should be resolved. Strategy papers served, in the best case, for government-internal working premises, and passed through parliament – if at all – only with the votes of the governing parties. Nothing illustrates the situation as well as the procurement of the Eurofighter TYPHOON from 2002. In this case the political demands were already vague. Of course, the aircraft should serve primarily for the protection of Austrian airspace, but – the publicly-expressed view of the defence minister at that time – this type would also be the best solution to make the integration of Austria in a Central European Airspace Management system possible; it would even enable participation in multinational air operations in the frame of peace-support missions. Basically a sound idea, but it was dropped due to a lack of basic political consensus by the successors in the office. Numbers of the fleet as well as the configuration were renegotiated subsequently, so that the Austrian TYPHOON actually only has the abilities of a bare air policing aircraft.

In 2003 a political-military "Federal Army Reform Commission" was created to end the problem of the absent strategic foundations for political consensus – as had been the case since the 1970s. The commission presented a noteworthy report with recommendations to the Federal Government in 2004. At their core the recommendations meant a reduction of the wartime strength of the armed forces to 55,000 soldiers, a radical reform of the personnel structure (flexibility and employment of younger staff) and comprehensive modernisation measures, including deep cuts on those structures which were relics of the Cold War. The Federal Army should be enabled – with a level budget of 1% of GDP – from 2010 on to assist the civil authorities at home if necessary, as well as making measured contributions to op-

erations within the scope of the UN and / or the EU. In the meantime, the essential parts (relevant for investment) of the implementation of these recommendations have ceased. On the one hand, successive governments felt not engaged with the report (strange, as experts of all parties and interest groups had co-operated in the commission); and on the other hand, politicians since 2008 have been occupied with overcoming the economic and bank crisis, which made a mockery of allocating a budget of at least of 1% of the GDP to be spent on Austria's military.

In 2012/2013 political uncertainty in the security- and defence-political domains reached a temporary high point, with a national poll about keeping the mandatory military service or changing to a professional service. Without clarification of the principle political questions, the population should also answer a subsidiary system question. The result reflected this uncertainty: two thirds of the voters decided for the retention of the apparently proven, mandatory military service.

A Way Ahead?

Since the end of the cold war Austrian politics have shown a worrying disorientation in shaping security and defence policy. Since then no-one has succeeded in achieving a cross-party political consensus about the principle questions, but answers are essential in order to position Austria in a European and global context; for the development of common strategies; and also for the development of Austria's own armed forces. How much integration and solidarity in the EU should prevail? What kind of armed forces does a nation state require in the midst of Europe – though still peaceful, in a globalized world becoming more and more volatile and uncertain; and which duties should they undertake?

Today the country is surrounded by friendly and de facto allied states. Even in the unlikely case of a new military threat from outside

of the EU, impossible at short notice and in the medium term, an attack could not affect Austria alone in the first instance, but would trigger common NATO defence and probably also EU defence. Therefore, the national defence of Austria can only be considered in a European context, no matter whether there are sufficient structures or not. Even the narrower, defensive, role of the armed forces has to be seen in the context of multinational cooperation on the basis of common standards.

However, new military threats have stepped in to occupy the place of the classical military threat. Unstable states on the European periphery, international terrorism, cyber-war and the proliferation of weapons of mass destruction now constitute the main challenges for peace and stability. Even if for the armed forces of Europe certain military functions remain "at home", multinational cooperation in this

Photo: Bundesheer/Ricardo Herrgott



Hans Peter Doskozil was appointed as Austrian Federal Minister of Defence on 26 January 2016.

context gains considerably in importance. In the course of mastering the manifold crises of the last years, not least the refugee crisis, the European political system has been put to a heavy test – even an existential test.

All European countries, in particular the smaller ones, are probably well-advised to sharpen the public consciousness about the importance of solidarity within the Union. The consequences of re-nationalisation of Europe are hardly to be estimated. But it is clear, in any case, that at least in terms of security- and defence-policy the smaller countries would be on the losing side. It is to be wished throughout Europe and Austria that at last this fact is understood. ■

Implementation of Austria's National Security Strategy and Defence Policy

Günter Höfler

Today and for the foreseeable future, landlocked Austria, as an EU member, is surrounded by friendly and democratic countries. Direct conventional military attacks on Austrian territory are unlikely; however a residual conventional military risk cannot be excluded. Armed conflicts in the immediate vicinity of the EU remain and represent a security challenge for Austria and others.

Europe – including Austria – is affected by new, non-conventional and “hybrid” threats. These include:

- Militarily-generated and fought conflicts in the EU neighbourhood,
- non-conventional attacks on the functionality of the state and its strategic and critical structures and the population's livelihood,
- international terrorism,
- the endangering of global commons,
- natural, technological and humanitarian disasters,
- cyber attacks on the state's sovereignty and/or infrastructure,
- violations of national airspace,
- and the use and/or proliferation of weapons of mass destruction

In 2003, the European Council adopted the European Security Strategy (ESS), which was extended in 2008 and in which the most significant threats to the European Union and the global challenges were enumerated. At that time the EU was working on a new ‘Global Strategy on Foreign and Security Policy’. Among these, for Austria, the following points are the most relevant:

- There is still significant military offensive potential in the vicinity of Austria and its use cannot entirely be excluded.
- This also refers to the flexible use of conventional weapons, irregular warfare, information warfare, terrorism and organized crime.

Author

Lieutenant General Mag. Günter Höfler leads the Austrian military mission in Brussels and is the Austrian representative in the military committees of the EU and NATO PfP. He was the former commander of the Joint Forces Command established in Graz in 2006, and as such was the highest-ranking Austrian troop officer.



Photo: Bundesheer

- This also refers to international transport routes, free access to resources and energy security.

Subsequently, in July 2013, the new Austrian Security Strategy (OESS) was concluded in parliament, and in October 2014 the sub-strategy for defence policy, which represents the implementation of the OESS for the Bundesheer (Federal Army), was presented by the coalition government. These two documents take into account the contents of the ESS as well as current and future possible security-political developments, and provide a comprehensive and future-oriented basis for the national security policy. Today it is undisputed that no European state can master present or foreseeable threats alone. At the international as well as the national level, only together, in a comprehensive approach by all relevant actors (such as politics, diplomacy, military, police and other civil public services), can one call this a ‘whole government approach’.

Austria endeavours to represent all this within the concept of “comprehensive security provision”, which means a systematic cooperation between various policy fields on the basis of an overall strategy. For the Austrian Army, on the legal basis of both strategies, the following defence policy mission is defined: “The Austrian Federal Army is defending Austria, its people and their livelihoods. It is the strategic ‘reserve’ of the Republic when all other institutions and services can no longer manage to protect it, and it contributes to the common security of Europe and adds a visible and prolific contribution to international peace and stability.”

The following tasks of the Austrian Bundesheer can be derived.

1. Tasks within Austria – in this order:

- “Classical” military defence against conventional or non-conventional attacks commanded by a government, and defence against cyber-attacks;
- Ensuring airspace sovereignty by continuous air-surveillance and peacetime air-policing;
- Assistance in interior missions to sustain public order and security if requested by the forces of the interior;
- Protection of objects of critical infrastructure;
- Monitoring of the national boundaries;
- Support in case of collapses such as the breakdown of energy supply;
- Support for major public events and summits;
- Assistance in natural disasters and technical or ecological challenges.

2. Military tasks within the EU are understood to be:

Military contributions to cope with consequences of terrorist attacks and disasters; Under political provisions – an optional contribution to the defence of the EU.

3. Military contributions to international crisis management:

This includes Austrian contributions to the overall spectrum of international peace op-

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Photo: Bundesheer

Disaster management is part of the Austrian Army's scope of duties. Shown here is a forest fire fighting operation.

erations and crisis management, and the evacuation of citizens from crisis regions that the Republic of Austria has a responsibility to protect.

4. Contributions in international humanitarian-assistance and disaster-relief:

Supplementary tasks within the concept of comprehensive security provision, especially in the fields of: developing a situational strategic picture; strategic leadership and leadership ability training; organizing and/or participating in nationwide crisis exercises. The sub-strategy of "defence policy" clearly points to the necessity of increasing and deepened international cooperation in training and materiel acquisition up to actual missions. What is new is that the previous strict separation between domestic missions and missions abroad is overcome, because missions abroad are increasingly defined as critical in the defence of national security.

Implementation

Since those doctrines and strategies represent the clear policy of the country's political leadership, it falls now on the same leadership to implement them. Such implementation might be 'preceded' by a "2025-vision of the creation and availability of a 'future-robust', 'mission-oriented and cooperation-enabled Austrian Federal Army'."

With all the procedural conditions explained, along a 'structure follows strategy' approach, additional steps of realization have now to be planned and executed. Based on a number of earlier "structural adjustment" steps, Federal Army structure has to be slimmed-down, especially in the areas of commands and administration. The profile of our own forces has further to be refined regarding the likely spectrum of missions. In the field of international cooperation, regarding availability of resources it is necessary to be more specific as to what the international request is, and how – by what means – Austria will contribute.

For the implementation of the national security strategy it is most important that not only the politicians but also individual

Austrians have a realistic awareness of security- and defence/political challenges. A contemporary defence/political approach is urgently required to be determined and communicated, in order to establish a nationwide understanding of today's "new defence" and to anchor the capabilities of modern forces and their participation in international missions within the population. "Defence" today happens within and beyond national borders, and this message needs to be spread to counter remaining national isolationism.

Realisation of all these doctrine- and framework-papers requires a clear political will and the creation of appropriate conditions on the part of the political leadership. It is for example fundamental to hammer out and introduce a contemporary service-, salaries- and pension-law for personnel in the Austrian Armed Forces. Suggestions have been on the table for several years: it is now high time to begin with their implementation.

Challenges

New threats and developments demand innovative solutions and our own innovation capability has to be increasingly combined with suitable partners. In the light of "comprehensive security provision" military co-

operation has accordingly to be pursued on the national as well as the international or bilateral level.

Our own contributions to international missions in the first place have to come at a contemporary standard, regarding capacity and protection. As crises can ignite the surprising or unexpected, the Federal Army increasingly needs its own rapid-deployable crisis reaction elements in a manageable size for missions in-country as well as for contributing to international crisis management. Reserve Forces and reservists are an indispensable supplement; their de facto tasks and mission options have to be defined more clearly.

Following the referendum in January 2013 with a 60% vote to keep conscription, an attractive and modern national military service is still the central foundation for the Austrian Army and its place within the population. Military training and conscript service have to be felt to be rational and meaningful by the people.

A future-robust Austrian Army has a broad spectrum of abilities and is able to react to different developments in the area in and around Austria. A particular strength is its capable cadres of standing professional personnel. For them it is essential to further invest in their ongoing education and training, but also in enhancing their respect and recognition internationally. Motivation of these core cadres is the cornerstone for our force capability. Next to a contemporary "corporate culture", the framework and the necessary resources are the best motivation for high-quality execution of demanding regular operations.

To slim-down the personnel structure and expenses in line with international standards, future careers for a predetermined period have to become the 'norm' when serving in the national forces be-

Photo: Bundesheer



Pledge of conscripts in Ampflwang on 5 February 2016

yond the conscripts' six months. In the sense of responsibility for their own employees, this also includes professional assistance by the federal employer in the later transfer into a civilian field of work. Such a thorough and comprehensive conversion or alteration of the whole decades-old personnel structure across the MoD itself and the cadres in the troops will require several years – the Belgian Army for example, needed 10 years for that undertaking – but it has to be started. Today the Belgian Army has established a convenient, functional, modern personnel system, which permits increased resources for operations, materiel acquisitions and modernisation.

Funding

If the long-overdue security- and associated defence-strategy set as defence policy goals by the politicians are seriously meant to be reached, the necessary and appropriate financial resources must also be allocated by the same. Here it is appropriate to recall a rare statement in this direction, from the nominal Supreme Commander, Federal President Dr. Heinz Fischer, from August 2014: "For fulfilment of given national and international missions, the associated and necessary budgetary, personnel and infrastructural provisions for the Federal Army have to be secured."

The Austrian reality is that, due to "savings" cuts over several years, the Army needs more funding, firstly to undertake contemporary daily service routines and then to implement the goals given by the two strategies. It has also to be remarked that and achieved "savings" within the military have to remain with it for other, pressing purposes. Today's allocation of 0.6% of GNP is a horrific taillight among the first-world nations of Europe. Comparable nations like Sweden or Finland have much higher budgets, and the gap in widening.

Conclusion

Viewed internationally, security policy is the basis on which all the other fields of politics and society are based. "Security" is the central requirement of and for the people, for which "the State" is, by definition, responsible: responsible politicians must satisfy that basic demand. Security policy and associated defence matters must be understood to be a chance for "active creation". Those two sound strategies are clear manifestos by the politicians – deeds must follow their written words. Whoever comes too late is punished by life – and sometimes history! ■

The Migrant Crisis: Austrian Army Assistance Since 2015

With the Ministerial Council's decision on 14 September 2015 the Austrian federal government decided to send up to 2,200 soldiers to deal with the refugee situation in a security/police assistance operation along parts of the nation's borders. The aim was to ensure a controlled and orderly conduct of refugee/migrant movements and to contribute to their initial humanitarian caretaking. Since 4 February 2016, 204 militiamen have been participating in the security/police assistance operation, representing more than 20 % of the 975 soldiers currently deployed. Since the beginning of the assistance mission to the Austrian forces of the interior, soldiers have taken over 170,000 migrants from Slovenia and channeled them further, prepared 140,000 meals and added some 300,000 km travelled by army vehicles.

The tasking order for these forces was to assist the police in ensuring public order and security. Accordingly, the soldiers had and have to cover a broad range of tasks. Among other things, a seamless and smooth flow of the shipments had to be ensured. Since among the refugees, asylum-seekers and potential migrants there were and are people of different ethnic groups and religious orientations, it further needs to be ensured that these individuals are placed separately and in different buses. Because of the over-proportional number of young and sometimes highly aggressive males among the incoming people, soldiers had repeatedly to ensure that women and children were not crushed to one side – or even prevented from boarding – the provided buses. Such, for example, was the case in the chaotic days of mid-September and in sudden clashes between Afghans and Syrians.



Photo: Bundesheer

Austrian soldiers in migration control mission

This Spring, the newly-appointed defence minister Hans-Peter Doskozil – a former provincial police-commander who 'successfully' managed the initial wave of migrants after Berlin (with Vienna) decided to open Austria's Hungarian border – announced a substantial reinforcement of troops to the assistance mission along the borders of Styria, Carinthia and Tyrol. Internal critics are however publicly pointing to weak spots and continuous additional strains for the underfunded Austrian military. While policemen are equipped with protective vests, pepper-spray and rubber-sticks for self-defence or to restore local order, Austrian soldiers were confronted with critical situations only equipped with regular orange reflective vests and their P80 (Glock) pistols. It is out of question – politically – that the latter be used even for possible warning shots; but also, robust riot gear and helmets were not distributed despite being in the inventory. Local commanders assume that it is not desired to create an excessively "martial" public impression – including among the media. Mr. Doskozil has meanwhile indicated he will re-assess the equipment level of the troops involved. Regarding the many thousands of kilometers travelled by military vehicles for the above purpose – while fuel for daily operations of regular units is rationed – it is often countered that these extra expenses would anyway be refunded by the Ministry of the Interior. Nevertheless, in times of replacement of specialist military platforms by commercial 4WD vehicles, and large-scale phasing out of platforms whose estimated repair bill exceeds €2,000, substantial additional abuse of the Army's specialist wheeled inventory remains obvious.

Georg Mader

“Rarely any applause...”



Since July 2013 Lt. Gen. Norbert Gehart has led the Austrian General Staff section-III “Provision”. Among other tasks, he is responsible for new and replacement acquisitions and in this role has been directly affected by the repeated cuts in defence funding.



Photos: Bundesheer

ESD: General, despite the possibility that we may see the downward trend being reversed, nationwide newspapers have gone to print with headlines like “The Army is down-saved to death”. How do you cope with that?

Lt. Gen. Gehart: Well, we will calmly see how the trend develops. But with the background of previous and valid budgetary realities, we can no longer “comb” across all the Federal Army to save a few funds here and there. We have done this for the last ten years, but now we are forced to undertake deeper and more painful steps.

ESD: What could those look like?

Lt. Gen. Gehart: We have to translate into action the reform of conscription ser-

vice [initiated after the positive referendum of January 2013] and at the same time uphold the mission readiness of the Army. For these purposes we need all the

current units. Against this background, we have to promote or give priority to the most likely mission tasks, and to cover these in the best possible way while pushing back less-likely tasks.



Austria had to drop the plan to add three additional S-70 BLACKHAWK helicopters to the current fleet of nine.

ESD: What branches of the service, or what missions could be affected or are ‘hit’ by being ‘pushed back’ into the rear?

Lt. Gen. Gehart: Among our weapon systems we have materiel like main battle tanks [LEOPARD 2A4] or self-propelled artillery [M109A5] which are indispensable for classic military territorial defence, with their likelihood to see combat however becoming very low. Therefore it would be logical not to build an emphasis or to focus on these capabilities, and rather to retain our knowledge of these systems based on only a small number kept in service. This is what is gradually happening now.

ESD: What funds can really be saved by such steps?

Lt. Gen. Gehart: We learnt that if we just reduce the number of such systems in particular branches, only a certain amount of funds can be freed for other, more likely



A question still to be decided is used or new Hägglunds ATVs from Sweden.

ESD: But are the daily routine and daily operations secured, in the light of such cuts or limitations in the materiel sector, such reduction of basic road-mobility... ?

Lt. Gen. Gehart: On the one hand we replaced parts of the vehicle fleet with new commercial Mitsubishi L200-4WD pick-ups, but we also need to help ourselves through redistribution measures. As we are not able to replace the whole ageing and sometimes "crumbling" fleet of wheeled vehicles, the "younger" ones are directed to where they are needed most. That is not a pleasing situation, yes, but it is not to be avoided – for the moment.

ESD: In the past there were offers to add three additional S-70 BLACKHAWK helicopters to the Austrian fleet of nine. Is there any chance of realizing that possibility?

Lt. Gen. Gehart: We had to drop this plan, and a plan for substantially more DINGO 2 ATVs to increase force protection. Both projects fell victim to the budgetary reaper, although single-digit numbers of DINGOs have been introduced in the meantime.

tasks, because the basic running costs of these systems and their maintenance and preservation will remain. Sensible and effective cuts in structures and daily operations will only be achieved if we drop a whole weapon system completely...

ESD: Which is only a step towards making complete sense: if you take the tanks away from a tank battalion then the unit is in fact no more...

Lt. Gen. Gehart: Well, we always can transfer such troops to basic infantry training, but that will rarely create applause and

motivation. There is rarely any applause at all, from both within the military or from the media. Thus, we try to save funds by other actions as well, like with the recently implemented military medical- and health-support re-organisation and the connected closure of military-run hospitals. From that it is possible to redirect about €10 million per year to other branches. Also there are reduced training and smaller exercises. We also have only partly replaced the Puch-G vehicles and we took the Pinzgauer ATV out of service earlier to avoid further costs of repair and maintenance.

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Currently under delivery we have protected multi-role vehicles [IVECO] and freshly-introduced transport boats for the engineers. Also upcoming is the purchase of shoal-type assault boats to improve infantry mobility. Another question still to be decided is used or new Hägglunds ATVs [Bandvagn] from Sweden.

ESD: Could air surveillance also become an area to be driven back or – as with other countries like Slovenia – to be “outsourced”, to save – in this case – considerable funds for other branches?

Lt. Gen. Gehart: You are aware of the delicacy of “outsourcing”, in the light of



(Photo: Mader)

In 2014 Wiener Neustadt's SME AIRBORNE TECHNOLOGIES came out with the self-invented S.C.A.R.-pod. The 160kg streamlined device carries an EO/IR-gimbal and creates an on-board WLAN between the pod and the cockpit. The pod was successfully tested in a NATO exercise under a Slovenian AF PC-9M and meanwhile has at least one military customer.

our neutral status, but of course one can always question alignment or changes in

procedures, to require fewer flying hours. There are considerations to focus on time-limited areas or certain geographical “quadrants”. But a direct repercussion of a further flying-hour reduction is pilot fitness. If you cut too many hours, fewer pilots can be kept at the appropriate level of physical fitness and thus flight safety.

ESD: Which means that any cuts have direct, negative effects upon quality and ability?

Lt. Gen. Gehart: There is no doubt that many steps and actions are and will be painfully felt at the troop level. Our ultimate goal is to keep the loss of output quality as low as possible...

ESD: How is the internal understanding in the General Staff and among its section leaders, regarding previous or current reductions, savings and down-gradings?

Lt. Gen. Gehart: The Chief of General Staff himself [Gen. Othmar Commenda] is spending much of his time behind closed doors with us because of this situation, and we all have ‘prescribed’ ourselves to a guideline to look for savings potential among ourselves, ahead of out there among the troops. We discuss this often and extensively in trying to reach a common solution – albeit I have to say that these are often painful...

ESD: Following the 2013 referendum, how should a solution concerning conscription reform appear?

Lt. Gen. Gehart: On one hand we have to focus on either solid basic infantry training with the associated “adventure factor” (the key event is field-camp week) – or on a comprehensive first-aid training. The overall goal is to make young Austrians feel that their time spent with us is exciting, time where they have learnt something for their life. Like a “School for the Nation”: that would be a role for us to propose with which I could be very positive...

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Budget: € 90 Million Extra for the Austrian Army, but...

Within the current annual Austrian budget, €2.07 billion (or 0.65% of GNP) is allocated for the Ministry of Defence. This is €90 million more than in the previous year, the first increase for many years. Since December 2014, there is also a “special investment package” of €616 million, planned in two tranches up to 2019 to cover urgent and overdue acquisitions, such as for the aviation branch. Additionally, in a rather unusual all-party parliamentary resolution on 26 November 2015, as a consequence of the terrorist attacks in Paris and a changing and more “chilly” European security environment, the (former) defence minister Gerald Klug was tasked to act on what the same parliamentarians in 2014 had concluded: the so-called “Structural Package 2018” was yet another austerity-package driving ever-shrinking defence expenditure that would have cut another €200 million per year until 2019. The “revolutionary” motion to cancel that package, to which Mr. Klug did not visibly react, is also said to have sealed his fate, leading to the appointment of former policeman Hans Peter Doskozil as Defence Minister.

Nevertheless these small financial indications for a reversed trend – positive all by themselves – (yet not taking into account the latest “assault”, in taking another €200 million from defence in April 2015 in order to contribute to financing a long-promised tax-reform) cannot mask or disguise a general budgetary non-defence “culture” and its years-long effects. Regarding modern equipment and armament, for decades the Austrian military has piled-up an investment backlog of at least €5 billion. Too often, technology generations could either not be followed at all or not be implemented across the whole force. The Austrian Air Force, for example, was accorded great extra respect by NATO Air Chiefs when it successfully “jumped” from the vintage 1960s, DRAKEN aircraft to the 4th-generation TYPHOON. The Vienna Institute for Strategy and Security policy (ISS), within the defence academy (LAVAK) – itself even likely to see the General Staff courses halted – listed this “history” in early 2015, in great detail: Since 2000 Austria has reduced military spending, measured at GNP, by 30% – even more than the whole of Europe (-20%). In 2015 defence funding was again cut by 6.5%, which means that, again measured against GNP, last year Austria spent just 50% of the European average. Because of inflation and a rising share of personnel- and regular running-costs from 66% today to up to 80% in the future, a further reduction of investment is to be expected. Over the last years, only 10% of the total funds were available to be invested in new or upgraded materiel, armament and infrastructure. In the future, it is expected that the investment share will fall to only 4-5%. This against an assumed or common international scale of 20% for replacement/acquisition of equipment and armament, in order to maintain modern military forces. That again means that Vienna will only spend 0.03% of the total GNP for (re)armament, a little less than 50% of what an average European State invests in forces equipment and protection. Or, the other way around: Austria spends only a tenth (10%) of the average European effort of 0.3%. Things will stay this way as long as the overall national defence spending remains in the area of ~0.7% of GNP and/or the headcount is not drastically reduced.”

(Georg Mader)

Austria's Security and Defence Industry

**Interview with Reinhard Marak,
CEO, Austrian Defence & Security Industry Group
(ARGE Sicherheit & Wirtschaft; ASW)**



(Photo: Marak)

ESD: ARGE Sicherheit & Wirtschaft – How exactly can it be explained?

ASW: We are a working group within the Austrian Federal Economic Chamber representing the interests of Austrian companies with customers in the public sector – typically national defence and security organisations – across all branches. In this sector both customers and suppliers are faced with very specific challenges and we can act as a service provider for both parties.

ESD: Which companies and which industrial branches are represented in the ASW?

ASW: The scope is significant and provides comprehensive coverage of almost all that is required by defence and security

the companies have to meet are extremely high, particularly as far as technological requirements are concerned. You must not afford any mistakes in this sector. Everything that is not high-tech or high-quality endangers the mission of the security and defence forces; in particular it endangers the people that have to accomplish the mission. To mention a concrete example: if a soldier cannot take advantage of the latest and most modern protection gear, the person and mission are unnecessarily endangered.

Security of Supply is another special feature of this sector. It is essential that the public customer is supplied with the required products and services, unconditionally. No-

ASW: The answer is relatively easy: in essence, there are three areas in which the state can support our industrial sector. First, we need investments for the industry; that means that the national security and defence forces must not ignore national industries for their procurement decisions – to the extent that the procurement laws and competitive bidding allow. Second, we need comprehensive investments in the kind of research and development efforts that the market requires. With that, you can ensure that your national industry will remain competitive on the future global market, too. Third, industry needs support in exports; what I am thinking of are practical and unspectacular means: as an example, the presence of high-ranking governmental representatives at respective exhibitions is helpful, and so is the provision of a forum for the presentation of our national industry at international events. ■



(Picture: WKO)

organisations. We are especially good in the areas of communication, cyber security, cyber defence, protected mobility and surveillance in support of operations as well as deployment means, to mention just a few areas.

ESD: You mentioned specific challenges. Can you elaborate on the subject?

ASW: This sector is characterised by factors that are different from other business sectors. We have a special client structure as a kind of customer monopoly – that is a limited group of states. The expectations that

body can afford to wait in a crisis situation. And long-term Security of Supply has to be ensured. Therefore, stability and predictability is needed for the industry, too. If investments do not have a return the companies cannot survive in the long run. In my opinion there are also issues of national security and considerations with regard to the safeguarding of jobs that suggest that a national industrial competence in this sector is essential and needs to be maintained.

ESD: Maintaining national industrial competence – how can that be achieved?

ASW

The Austrian Defence & Security Industry Group (Arbeitsgemeinschaft Sicherheit und Wirtschaft – ASW) of the Austrian Federal Economic Chamber has some 90 industrial members with a gross annual turnover of about half a billion Euros. The export share of the sector is in excess of 90%. ASW represents the interests of these companies and serves as a central platform and service provider between customers from the public administration and industry.

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Silver Lining over Austrian Skies?

Georg Mader

The Austrian Air Force (AAF) in the early 2000s experienced a long-overdue materiel rejuvenation. With EUROFIGHTER, BLACKHAWK and HERCULES the alpine “air-arm” more or less “returned” to the level one would expect of a wealthy nation of the first world. For decades, most of AAF inventory was “dozing” at an early Vietnam War level due to political negligence. However, 15 years have passed and – with the independent air command having been dissolved in 2006 – only minor upgrades and acquisitions have taken place since. As today's more “chilly” European security climate is – with some delay – now also being felt in Austria, there is a good cause to briefly look into the current state of each Austrian platform.

EUROFIGHTER

Operating the 15 Tranche-1 (T1) single-seater TYPHOONS, renegotiated down from 18 Tranche-2 (T2), “castrated” in terms of theirIRST and EW and partly changed to second-hand German airframes when the Social Democrats took over Vienna's Ministry of Defence in 2007, has become daily routine under full Austrian control – at least regarding the part of maintenance-centre No.2 (FIWft2) at Zeltweg. However, the ISS contracts to support them – signed with the manufacturer under the previous administration – have been described to the author as “prohibitively expensive”, so flying-hour costs remain at levels creating jealousy throughout the rest of the Bundesheer (Federal Army). But that is less the fault of a particular type of aircraft, than of chronic non-spending on defence over decades.

Reflecting this approach were several politically-driven “reform-packages” which “merged” into one another and, since 2006, cost the equivalent of an entire annual defence budget. For several types in the inventory – like the C-130Ks – this meant fuel-rationing and a reduction of flight-crews; for the TYPHOON down to 1,070 fleet-hours per year and a fall back to 12 pilots. Sources in the AAF unofficially point out that if they were allowed to fly 1,500 or 1,700 hours per year- which FIWft2 could easily support – they could budget on an hour for €36,000 – the cheapest among all TYPHOON users.

Regular maintenance and checks at FIWft2 in the meantime are now at such a high

Photo: Mader



A mid-life update of Austria's TYPHOONS seems unavoidable in the coming years.

level of self-sufficiency that they have become a “role model” for other TYPHOON operators. Even major inspections and acceptances are carried out without the assistance of foreign auditors, which saves precious funds. While it now looks – positive for Austria – as though Britain and Germany will fly their T1s a good decade longer than originally planned, the spare parts availability cycle for T1 in the long-term is a “dwindling” issue. Therefore the system engineers in Styria are – with consumables/rotables still in the manufacturer's production cycle – successfully using T2 parts whenever they can. This practice results in a continual “rejuvenation” of the fleet which, following software-upgrade 4.3 -enabling drop-tanks for T2s – is described to the author by a TYPHOON test pilot anyway as “the hottest T1s anywhere”. Nevertheless, given the progress of the programme in general, a mid-life update seems unavoidable in the coming years. But ahead for now is the type's “Goldhaube” (Golden Cap)

data-link embedded within the national air-surveillance system, which is based on three new international-standard, modern, long-range, Alenia RAT-31DL radars on mountain peaks. Austrian TYPHOONS remain armed for – so far just daytime – QRA with a gun and IRIS-T IR/WVR missiles. Single replacements within the current “elite” of 12 pilots are trained in Italy to Level 3 and 4, because after basic and a little tactical training on the obsolete Saab-105 the 50-year gap to 4th generation is unbridgeable in Austria. At Lecce, among seven other nations, one or two Austrian aspirants and an Austrian instructor – the latter for all students – are reaching advanced training levels on MB.339D and, since 2016, also on T.346A (M-346 MASTER) aircraft. This is rounded up by some flights in the TYPHOON two-seater with JG73 at Laage. Austrian acquisitions interestingly have ignored two-seaters since the SAAB DRACEN of the 1980s.

Author

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

Saab 105 / Trainer Successor

The most pressing acquisition solution ahead has to be initiated this year for the replacement of the remaining 45-year old SAAB-105 jet-trainers. According to the Austrian "Air Chief" Brigadier Karl Gruber, the 12 structurally most "sound" of 28 may be required to fly until 2020 the latest. Since they can no longer work with many of today's navigation aids, those 12 are domestically – in Austria's own work-

a leasing option also considered." It remains to be seen, if such an option with all associated warranties and insurances will be offered at all.

C-130K HERCULES

Early 2016 saw a heated debate connected to the mass migrant-flow, with the new minister agreeing to – and even suggesting – what last summer was initially demanded by right-wing MPs in parliament: To deport

board self-defence systems are indispensable. On the latter there is to be seen – with a 2016 decision assumed – a focus on the IR spectrum with MAWS and flares. As there are several – especially Israeli – manufacturers of such systems, an invitation for such a tender is expected. The regular maintenance cycles at Marshal of Cambridge – the three are ex-RAF with the refuelling-probe removed – reportedly are not affected. One hour of C-130 operation is calculated in Austria to cost about €14,000.

Pilatus PC-6 TURBO PORTER

One of the oldest and by many seen as "most unsexy" types in the inventory obviously has "the third life". Coming with sensationally low-cost flight hours and huge versatility, the PORTER is internally referred to as "the drone of the AAF" (which has not yet arrived in the UAV era). In addition to examples equipped with optical- and IR-recce sets, parachute-training for the special-forces, water-bombing of forest-fires or regular liaison flights are constantly undertaken, with no sign of weakness. A new and interesting role is envisaged in carrying a radio relay-station to increase cross-service coverage in typical mountainous topography at large-scale events or disasters.

Pilatus PC-7 TURBO TRAINER

12 out of 16 PC-7 Mk1s are used in Zeltweg for basic pilot training and against slow-movers in air-policing missions during large-scale events, like the annual WEF in neighbouring Davos. Then they are equipped with 12.7mm MG-pods and are carrying the usual "Call 121.5"-tags. After 32 years the PC-7s require a replacement of some avionic-components. With a cost-effective solution sought, a full glass-cockpit, as offered by the manufacturer as the PC-7 Mk.2 or NCPC-7, is rather unlikely.



Photo: Mader

According to defence minister Hans Peter Doskozil, "a financially-justified decision" on the replacement of the remaining 45-year old SAAB-105 jet-trainers should happen within 2016.

shops – moderately retrofitted with radios providing 8.33 KHz channel separation and built-in GPS. A prototype has flown. Every fortnight this type of aircraft is still taking over QRA from the 15 TYPHOONS – a very low number for a 365-day QRA – so a successor will not only have to shoulder the "download" from TYPHOON into cheaper hours for companion-training, but also for armed air-policing. Next to an appropriate climb-rate, an "ideal" situation would be achieved if the "download" would be far-reaching enough to allow any pilot to fly both platforms. A dedicated working group is currently extensively evaluating the market, with – to the author's knowledge – the Italian-built M-346 as a kind of logical "frontrunner". This also because of the close ties to Lecce and the perfect on-board simulation of radar and weapons the Italians are already using in their own training model towards TYPHOON – and soon F-35. Costs are expected to be +/- € 30 million flyaway/aircraft. Other solutions for the necessary 8 to 12 could be a new BAE HAWK or – less likely – maybe a financially-"dictated" Czech L-39NG. According to the recently appointed defence minister Hans Peter Doskozil, "a financially-justified decision should happen within 2016, with

rejected asylum-seekers with the service's three Linz-Hörsching based C-130Ks. Militarily however, a decision is expected on a future mission-envelope and the level of on-board self-defence. 1) Regular transport-flights as today, like a cargo airline, 2) flights under irregular conditions like without Nav-Aids, into zero ATC or into irregular airstrips or with the use of NVGs – or 3) even into regions with likely hostile actors. For the third category, combat-landing training, seat-, engine- and floor-hardening as well as on



Photo: Mader

Cockpit displays of a BLACKHAWK

S-70 BLACKHAWK

The nine largest helicopters of the AAF have – despite some offers and opportunities – not managed to grow to the “usual” number of 12. Nevertheless, their introduction happened 13 years ago and it is absolutely pressing to launch a much-needed and long-overdue upgrade/replacement of their cockpit MFDs, the related avionics computers and their software. Otherwise the most capable and – in public opinion – “popular” platform will not be able to fly IFR in 2017, and later on not at all. Sometimes the moving map mode “freezes” in quick zooming, requiring an in-flight restart of the system. Because of the various solutions and prices of several providers – Israeli companies are particularly active with Austria on their “radar” again – it is yet not known when the +/- € 80 million contract might turn into an RFP. Reportedly this has nothing to do with the OEM, Sikorsky, recently having been acquired by Lockheed Martin. A little progress meanwhile is to be seen in Electronic Warfare. As the Austrian S-70A42 variant was supplied with contemporary self-defence sensors, the associated threat library software was long-neglected. For a time it was expected that the library could be “organised” via friendly nations or partners – which unsurprisingly did not happen as everybody collects and protects these ELINT-assets carefully as a critical cross-service matter. (Reminder: The Austrian high-end platform TYPHOON has no such issues, as its EURODASS EW-components were ripped out and exchanged for ballast in the re-negotiations without any military reason, according to the national GAO). Meanwhile the S-70 squadron is working its way into EW, as is the Air & Air Defence troops’ school in Langenlebarn. Again, the focus is on the IR-segment.

Agusta-Bell AB212

Based on the demand to keep a larger number of “cheap” rotary-wing platforms versus fewer new or modern types, and connected to keeping Linz-Hörsching as a helicopter-base, it was decided in 2010 to launch a “Mid Life Update” of the 23 remaining Agusta-built AB212 TWIN HUEYS. This undertaking – targeted to be finished in 2014 – however ran under an unlucky star. Still not fully completed by 2016, the work addressed to OEM Agusta was initially characterised by the surprisingly poor workmanship. Because of non-standardised wiring with cable-bundles placed in different ways in each platform, wiring around sharp edges and problems in diverting heat from the new cockpit elec-



Photo: Jarsch

The Mid Life Update of the 23 remaining AB212 comprises new cockpit electronics.

tronics, much work was rejected. To solve this, helicopters had to be sent back to Italy and/or Agusta personnel had to move to Linz. Meanwhile these days are over and the programme seems to be well on track; there are no more “analogue” 212s in Hörsching. From those who operate with the new MFDs, NVG-capability and provisions for self-defence, one only hears applause. Even if the initially-proposed costs of €63 million were – partly because NVG was added later – exceeded by some 20%... In service since 1980, these two-bladed workhorses now are expected to celebrate their 50th anniversary in Upper Austria.

OH-58B KIOWA and ALOUETTE-III

With both types obsolete in contemporary military terms, both have nevertheless taken over essential roles. The ALOUETTEs are described as being very useful in mountain operations – not that uncommon in Austria – and are shouldering rotary-wing training since the Bell 206s went out of service. The KIOWA remains the only permanently armed helicopter in the AAF inventory, while the S-70 is rarely seen with its long-hidden door guns. Bringing the OH-58B’s 7.62mm minigun to multinational rotary-wing exercises like “Hot Blade”, it is still highly valued against low-key opponents in the landing- or drop-areas. Nevertheless, there is no further investment in these two types, with a tender for a modern multi-role helicopter replacing both to be expected this year. Landing in Austria by 2018/19 is an EC645T or a Bell-407MRH (an armed version of the commercial 407GX) or an Agusta-Westland equivalent. There is no known determination of single- versus twin-engine. Almost certainly however, a

1:1 replacement of 40 helicopters is nowhere to be expected: 12 to 20, spread out over several locations is more likely. This also because of basing policy, as closure of the only “alpine” airbase at Aigen im Ennstal would be – and is being – highly contested by regional politicians.

Financial Cover Secured?

Many of the plans and programmes described above might for many seem to be unrealistic or doomed again to land in the political waste bin – like several in the past. But those responsible in General Staff departments, and “representatives” for individual acquisition programmes, appear to irrefutably count and rely on special financing approved by a parliamentary majority in December 2014 for urgent military investment. Out of the €616 million earmarked, €350 million will be available until the next regular elections in 2018, while the rest are a “financial commitment” up to 2020. This should give Austrian MoD planners some predictability. They will need it: the AAF replacement projects especially will be the most expensive and contested programmes among similar necessary and justified requirements throughout the whole Bundesheer. Also worth mention here is November 2015’s so far unparalleled parliamentary action by an all-party motion, calling on the defence minister to reverse the planned cuts masked as “Reform 2018”. Thus, under all these premises, one could really come to believe that sufficient funds for all these projects will actually or could actually be available. Time will tell if the changing security environment also honestly changes the thus far “comfortable” Austrian approach... for example, the border with Ukraine is closer to Vienna than the border with Switzerland. ■

Exercise Trident Junction Certifies NATO Response Force

The Alliance's biggest exercise in over ten years trains land, air, maritime and special forces

Nicholas Fiorenza

NATO's largest exercise in over a decade trained, tested and certified the NATO Response Force (NRF) and its new very high readiness task force (VJTF) from 3 October to 6 November 2015.

Exercise Trident Junction 2015 (TRJE15) involved over 36,000 personnel from all 28 alliance member states, plus partner countries Austria, Bosnia-Herzegovina, Finland, Sweden and Ukraine. The exercise

Allied Command Transformation (ACT) in Norfolk, Virginia, prepared and oversaw the exercise. Its Joint Warfare Center in Stavanger, Norway, developed the nearly 4,000-page exercise scenario, dubbed

Mercier, said made TRJE15 more complex than Exercise Strong Resolve 2002, NATO's last large scale exercise, held mainly in Norway and Poland on 1-15 March 2002 and involving 40,000 troops.

Mercier added that even new threats that emerged since planning for TRJE15 began were integrated into the exercise. Participants in TRJE15 also countered chemical, biological, radiological and nuclear (CBRN) threats, like they did during Strong Resolve 2002.

Comprehensive Approach

The exercise scenario foresaw NATO conducting a non-Article 5 (the North Atlantic Treaty's collective security clause) crisis response mission to deal with violence against the civilian population, including women and children, and a humanitarian crisis in a hostile government-controlled media environment. In order to deal with this "crisis", under its comprehensive approach NATO worked with more than a dozen international, governmental and non-governmental organisations in the exercise, including the European Union, the Organisation for Security and Cooperation in Europe, and the African Union, either as participants or observers.

For the first time, 39 defence companies were invited to the exercise "to observe evolutions, with the aim of generating exchanges and to bring insights and perspectives to possible technological solutions for the future and to accelerate military innovation," said British Army Lieutenant General Phil Jones, chief of staff of ACT.

TRJE15 consisted of two parts, a command post exercise (CPX) on 3-16 October and a live firing and training exercise (LIVEX) from 21 October to 6 November. The CPX covered the entire exercise area, from Supreme Headquarters Allied Powers Europe (SHAPE) in Belgium and Joint Force Command (JFC) Brunssum in the Netherlands down to the unit level in Italy, Spain and Portugal and offshore. Participating in the CPX were eight EU officers from the operational headquarters in Ulm. Iceland's participation consisted



Photo: Rui Heleno

PANDUR 8x8 wheeled armoured personnel carriers on a live fire exercise at Santa Margarida training area, Portugal, during Trident Juncture 15.

area was mainly in Italy, Spain and Portugal and the adjoining Mediterranean Sea and Atlantic Ocean, but also included Canada, Norway, Germany, Belgium and the Netherlands.

As the NATO command responsible for training and experimentation, Supreme

Sorotan ("sør" means "south" in Norwegian and "OTAN" is the French acronym for "NATO"). This postulated political instability, ethnic tension and socio-economic problems, exasperated by a water shortage, in the fictional Cerasia region far away from NATO territory leading to the nation "Kamon" invading the weaker country "Lakuta" to seize a key dam. The United Nations then gives the Alliance the mandate to intervene in the face of hybrid warfare and theatre ballistic missile threats, which Supreme Allied Commander Transformation, French Air Force General Denis

Author

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of a female member of the coast guard observing the exercise to prepare for her country's participation in future exercises. The LIVEX was NATO's first large-scale exercise since its involvement in Afghanistan, with the participation of four multinational brigade-size units and more than 60 ships and 140 aircraft. The four largest participants were the United States (6,500 troops), the hosts Spain (6,300) and Italy (4,000) and Germany (3,000).

Key Role of Maritime Forces

The Chairman of the NATO Military Committee, Czech Army General Petr Pavel, emphasized "the key role of maritime forces" in the exercise. These included 68 surface ships, nine submarines, eight maritime patrol aircraft, 12 MV-22 OSPREYs, and over 3,000 marines.

Two amphibious groups, one organised around the landing platform dock (LPD) HMS BULWARK of the British Royal Navy operating east of Gibraltar and the second around the Royal Netherlands Navy LPD HNLMS JOHAN DE WITT, acted as command ships for landings on four different beaches in the Mediterranean and Atlantic. British, Dutch, Italian, Portuguese and US Marines conducted joint operations. For example, US and Portuguese marines conducted an amphibious landing at Pinheiro da Cruz, Praia Da Raposa beach, Portugal, with two US landing craft air cushion (LCAC) military hovercraft from the LPD USS ARLINGTON, supported by CH-53E SUPER STALLION helicopters.

Helicopters and OSPREYs did cross-operations landing on ships of different nations. During the exercise, OSPREYs landed on the British Royal Navy helicopter carrier HMS OCEAN and, for the first time, on the JOHAN DE WITT.

Photo: AJFC/Klaus Sattler



A CC-130 HERCULES from the Royal Canadian Air Force refuelled this Italian TORNADO during Trident Juncture 15.

Naval Striking and Support Forces NATO (STRIKFORNATO) acted as the opposing force, with 20 surface ships and four submarines, plus aircraft.

German Army General Hans-Lothar Domröse, commander of JFC Brunssum who was the overall exercise director, said one new aspect of the exercise was submarine operations and the scenario envisaged 21st century threats, including anti-ship missiles.

Air Support

The air component of Exercise Trident Juncture 2015 was directed by NATO's Allied Air Command in Ramstein, Germany. Tactical air operations were controlled by the Italian Joint Force Air Component (JFAC) at Poggio Renatico, northern Italy. There was close coordination with local operations control units in Trapani. Italy, Albacete, Spain, and Beja, Portugal, and with host and troop contributing nations. The JFAC commanded and controlled the more than 140 aircraft participating in TRJE15 from bases in Zaragoza, Albacete, Palma de Mallorca and elsewhere in Spain; Trapani, Pisa,

Decimomannu and several other locations in Italy; and Beja and Monte Real in Portugal. Most of these were combat aircraft: EUROFIGHTERS, TORNADOs, F-16s, F-18s, MIRAGE 2000s, JAS-39 GRIPENs, HARRIER IIs, AMXs and L-159s. Also involved were 19 air transports (C-130s, C-160s and C-295s), nine aerial tankers, and two NATO E-3A, one RAF E-3D and one French Air Force E-3F airborne early warning and control systems, plus 36 helicopters, two OSPREYs and three unmanned aerial systems. The latter were a US Air Force GLOBAL HAWK and Italian Air Force MQ-1 PREDATOR and MQ-9 REAPER (PREDATOR B) unmanned aerial vehicles. The aircraft were provided by 16 NATO allies and partner countries. Finland and Sweden participated with four F-18s and eight GRIPENs, respectively, while Ukraine provided an ILYUSHIN IL-76 transport. Based in Italy, Spain and Portugal, these air assets supported army, maritime and special operations forces with intelligence, surveillance and reconnaissance, close air support, troop transport, personnel recovery and search and rescue missions.

In addition, US Air Force C-17s deployed troops and equipment for the exercise and two B-52s flew directly from Barksdale Air Force Base, Louisiana, to overfly the San Gregorio training area in northern Spain during the Distinguished Visitors' Day on 4 November in a mission that lasted 23 hours.

Mercier said TRJE15 tested joint intelligence, surveillance, target acquisition and reconnaissance (JISTAR), adding, "What we did was successful but secret." The GLOBAL HAWK provided ground and surface surveillance data of the exercise area in the form of moving target indications. Land forces participating in the exercise were led by the headquarters of the NATO Rapid Deployable Corps Spain (NRDC-ESP), based in Valencia, which deployed to San Gregorio to command and control ground

Photo: AJFC



NATO warships performed complex manoeuvres in close formation in the Mediterranean during Trident Juncture 15.

forces during the LIVEX. Numbering over 12,000 troops, these included multinational brigades led by Canada in Santa Marguerida in Spain, by Italy in Capo Teulada in Sardinia, and by the UK and Spain in the Chincilla and San Gregorio training areas in Spain. NRDC-ESP also commanded an Italian field artillery brigade and a task force of the 2/508 battalion of the US 82nd Airborne Division. Some 500 US plus 23 Spanish paratroopers were dropped from seven C-17s flying directly from Fort Bragg, North Carolina, to San Gregorio during the 4 November Distinguished Visitors' Day in a mission which included air-to-air refuelling over the Atlantic Ocean. Exercise host nations Spain and Portugal provided opposing land forces for the LIVEX, with Spanish Army LEOPARD 2s even clashing with US M1s.

Demanding Certification

As TRJE15 drew to a close, NATO Secretary-General Jens Stoltenberg said, "Allied troops have been tested at land, at sea and in the air. Allied forces have improved their readiness, their skills and their ability to work together in crisis situations," demonstrating "that we can deploy high readiness forces from across the Alliance in a matter of days."



Photo: NATO / Santa Margarida LOPSCON

Mass drop of Canadian and Portuguese paratroopers at Santarém, Portugal, during Trident Juncture 15.

TRJE15 certified JFC Brunssum to be on standby to command and control the NRF if it is activated in 2016, the NATO deadline for the force to achieve full readiness. The exercise certified the components of NRF 16: NRDC-ESP, the JFAC in Italy, the UK Maritime Force (UKMARFOR), the US Special Operations Command Europe, and the Polish CBRN Task Force. Mercier described certification as "demanding" and Domröse declared JFC Brunssum ready to lead NRF 16.

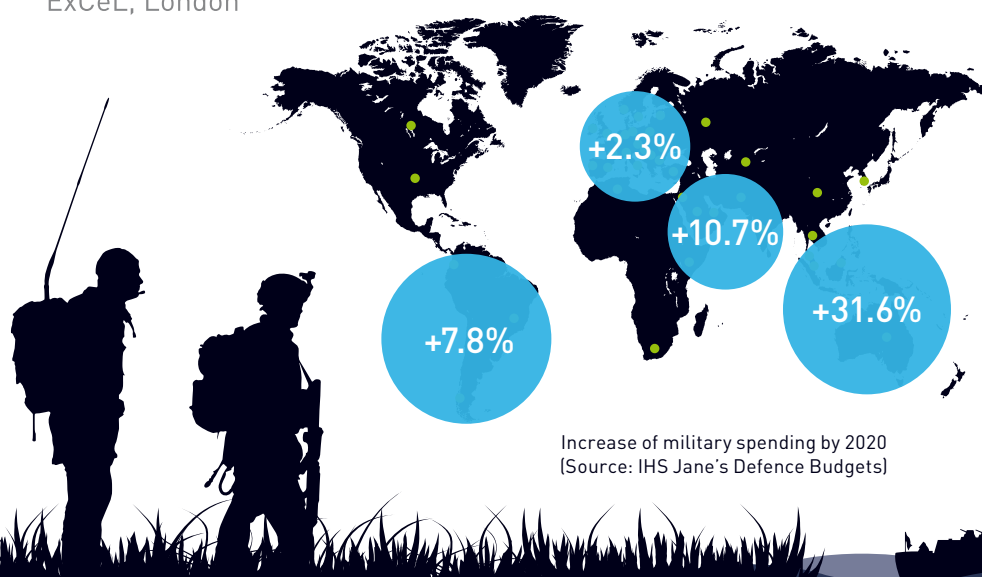
Mercier described the exercise as "a flagship for the Connected Forces Initiative", which aims to enhance the high level of interconnectedness and interoperability allied forces have achieved in operations and with partners. Multinational participation in TRJE15 went down to the individual unit level, as witnessed by the composition of the four brigades involved in the LIVEX.

Mercier said the next exercise on the scale of TRJE15 will be held in 2018.

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“Our acquisition role is expanding.”



**Interview with Rear Admiral, U.S. Navy (retld.)
Mike Lyden, General Manager of the NATO Support
and Procurement Agency (NSPA)**

ESD: What is the actual business of the Agency?

Lyden: As NATO’s premier logistics and procurement services provider, the NATO Support and Procurement Agency (NSPA) serves as a contract integrator, consolidating requirements of one or more nations, awarding contracts for them through international competitive bidding, and then overseeing execution and quality management. The full range of NSPA’s products and services are arrayed across five primary Capability Areas:

Support to Operations and Exercises – Under the umbrella of Real Life Support, NSPA can provide food, housing, laun-

dry, base support (such as building maintenance) and airfield operations (such as air traffic management, cargo movement). NSPA has a professional track record delivering these

services in theatres of operations from Afghanistan to Kosovo, in Mali and in Iraq. Strategic Transport and Storage – NSPA can coordinate provision of all modes of transport (air, sea and land) both globally and within Europe. This transport capability includes three NATO C-17 aircraft based in Hungary that form the Strategic Airlift Capability.

Fuel Management – NSPA offers procurement, distribution, storage and delivery services for both military and commercial customers. Our Central Europe Pipeline System (CEPS) provides the aviation fuel to support commercial operations at Frankfurt Airport.

Systems Procurement and Life Cycle Management – NSPA offers full-spectrum acquisition, maintenance, and operation of all types of National and NATO weapon systems.

Logistics Services and Project Management – NSPA is a leader in e-Procurement for NATO offering its world-class capability to Nations and other NATO activities. Other services include traditional procurement, infrastructure construction, ammunition demining and disposal, and environmental services. NSPA provides project management capability across a broad spectrum of requirements including execution of numerous NATO Trust Fund projects in areas such as Georgia and Afghanistan.

ESD: How does NSPA involve the defence industry from all the NATO nations in the light of shrinking defence budgets?

Lyden: Through a strong outreach program, we are able to continuously involve our many industry partners in our procurement requirements. At the core is our NSPA website, a “doing business with NSPA” e-hub where we register firms, publish

Future Business Opportunities (FBOs) and Requests for Proposals (RFPs), and summarise details on awarded contracts. This is reinforced with our active engagement in industry events including national industry days, major defence exhibits and conferences. We also host focused industry days at our headquarters in Capellen, Luxembourg when requested by Nations. We also regularly host industry representatives at our headquarters.

The key point to remember is that in order to do business with NSPA, companies must first register with our online Source File – a simple online process. This can be accomplished by visiting our website. Once registered, companies are eligible to submit proposals in response to RFPs and be considered for award of contracts matching their offerings. They can also return to the website regularly to preview our upcoming business opportunities and have access to the other resources. We are also on Facebook and Linked In.

ESD: After completion of the agency reform, how is the agency operating today? Are there more organisational changes foreseen for the future?

Lyden: The Agency has been very successful since its start-up in July 2012. Its three business units – Logistics Operations, NATO Airlift Management (NAM), and Central Europe Pipeline System (CEPS) – have been leveraging cross-organisational opportunities such as engineering talent. Support functions have been integrated across the Agency with common, best-practice personnel, financial and procurements systems. These efforts have delivered over 15% in overhead savings through 2015 while the level of business has increased by 40% from the 2010 Agency Reform baseline.

In April 2015 the North Atlantic Council (NAC) approved the addition of an expanded procurement and acquisition role for the Agency and our name was changed to the NATO Support and Procurement Agency. In particular, this brings the opportunity to support large-scale, multi-national acquisition programmes throughout the entire life cycle.



(Photos: NSPA)

NSPA can coordinate provision of all modes of transport both globally and within Europe.



NSPA offers procurement, distribution and storage of fuel and delivery services for both military and commercial customers.

ESD: What does the future look like for the Agency?

Lyden: Our future is very bright! We continue to match our portfolio of products and services in the five Capability Areas to the evolving priorities for NATO, and its Nations and partners. We have proven our operational expertise in Afghanistan and are now leveraging that capability around Europe, Asia, Africa and beyond. In particular, NSPA is positioned to assume a critical support role for NATO's Readiness Action Plan (RAP).

As mentioned, our acquisition role is expanding. While traditionally we have focused on weapon system support, our new mandate spans the entire life cycle of an acquisition programme. We are teamed with the European Defense Agency (EDA) and Organization for Joint Armaments Cooperation (OCCAR) for acquisition of Multi Role

Tanker Transport (MRTT) aircraft for several nations. Once delivered NSPA will assume responsibility for the life cycle management and support to operations. NSPA has also been designated by the NAC as the Life Cycle Management Agency for NATO's Alliance Ground Surveillance (AGS) platforms to be based in Sigonella, Italy. In addition to this, the Agency is playing key roles in many acquisition programme initiatives for individual Nations.

The Agency will continue to look across its Capability Areas to develop and deliver new products and services to meet evolving requirements. A key component of the future will also be leveraging NSPA's proven capabilities across new customers and geographic regions.

ESD: The concept of weapon system partnership has long been an effective tool in

NSPA. Will this be expanded to the UAV and JSIR areas?

Lyden: Traditionally, NSPA has been a key enabler for multinational cooperation among Allies and partner nations through Weapon Support Partnerships (WSP). Under NSPA these have been renamed as Support Partnerships (SP) to expand their applicability to other areas such as logistics services. The value of SPs is as important as ever- the current 28 partnerships bring nations together to obtain responsive, affordable capabilities that meet common requirements.

NSPA has established a Support Partnership focused on Unmanned Aerial Systems (UAS) which can be adapted by the member Nations to support any of their systems. The current focus is on tactical and medium-altitude, long-endurance UAS.

Similarly, NSPA is an integral player in NATO's Joint Intelligence, Surveillance and Reconnaissance (JISR) capability area. The Agency has been tasked to establish an Alliance Ground Surveillance (AGS) SP, consisting of all 28 NATO Nations, for the life cycle management and support for NATO's AGS core system including the Global Hawk unmanned aerial vehicles based in Italy.

ESD: Under the lead of CNAD, evaluations have commenced with regard to life cycle management issues for a "Future AWACS" system. What role is NSPA to play here?

Lyden: NSPA has been engaged in supporting NATO's Alliance Future Surveillance and Control (AFSC) working group. At this point – pre-concept phase defining the requirement – it is too early to project any specific role for the Agency, although with our ongoing in-service support to the NATO Airborne Early Warning and Control System (AWACS) programme and multinational acquisition experience, the Agency

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The NSPA has been tasked to establish an Alliance Ground Surveillance (AGS) Support Partnership for the life cycle management and support for NATO's AGS core system.

could be leveraged to take on a key role in any future initiative.

ESD: NSPA is understood as the leading management organisation for codification issues (AC/135). How does your agency incorporate internet-enabled tools to interact with industry?

Lyden: NATO Codification offers a "common language of logistics" and provides globally recognised means to describe and identify assets in a uniform manner. The NATO Codification System is managed and run by a NATO Cadre Group consisting of the National Directors on Codification Allied Committee 135 (AC/135).

NSPA provides specific technical and administrative support to AC/135. For example, NSPA consolidates all codification data into the NATO Master Catalogue of References for Logistics (NMCRL) and provides internet access to industry. NMCRL facilitates access to more than 18 million NATO Stock Numbers associated with information on the alternative sources of supply used by the Armed Forces of NATO and Partner countries. Industry is encouraged to enrich their data in the system by uploading item images. Moreover, NSPA assigns NATO Commercial And Government Entity (NCAGE) identifiers to industrial partners, which are essential in doing business with governments.

ESD: What role does NSPA play in the regular LCM workshops organised by NATO's Life Cycle Management Group (AC/327)?

Lyden: NATO's Systems Life Cycle Management (SLCM) policy is to optimise defence capabilities taking into account factors such as performance, cost, schedule, quality, operational environments, integrated logistics support and obsolescence. NSPA is heavily engaged in providing support to the user groups of the NATO's Life Cycle Management Group (Allied Committee/327).

During the LCM workshops, the NATO Agencies regularly report on their implementation of LCM-related products including related challenges, deficiencies and successes in meeting specific programme



The NSPA serves as the Host Nation for the development, acquisition, delivery and acceptance of several Deployable HQ Camp Capability Packages (CPs).

needs. During the 2015 workshop the specific topic of configuration management was addressed. NSPA highlighted its innovative capabilities to manage technical information exchange in an extremely responsive process. This capability is paramount to successful configuration management.

ESD: Could you briefly elaborate on the NSPA support to the NSIP Programme? What projects are currently ongoing, what are the plans and perspectives in this respect?

Lyden: The NATO Security Investment Programme (NSIP) provides NATO common funds for the development, construction and implementation of facilities that are required for NATO missions beyond those provided by member nations. NSPA acts as the Host Nation (full responsibility) or in a support role to the Host Nation. Its work spans two project categories: Alliance Operations and Missions (AOM), and Capability Packages (CPs).

In support of AOM, NSPA continues to deliver NSIP infrastructure projects in support of NATO operations in Afghanistan and Kosovo. These include camp construction, provision of camp utilities, aircraft operating facilities, force protection structures, road and bridge works, and airport runways and taxiways.

NSPA also serves as the Host Nation for the development, acquisition, delivery and acceptance of several Deployable

HQ Camp CPs. Most prominent of these are 100, 200 and 500-man camp infrastructure to host NATO Command and Control elements during exercises and operations. In 2015 these camps were successfully deployed in support of the NATO exercise TRIDENT JUNCTURE 15 in Spain and Portugal. Future CP projects will deliver a rapidly deployable, tailored capability to the NATO Response Force (NRF) and the Very High Readiness Joint Task Force (VJTF).

The questions were asked by Jürgen Hensel.

To Buy and to Sell

Evolving Armoured Vehicle Markets in Europe and the Middle East

David Saw

Within the wider Europe & Middle East area there is a profusion of armoured vehicle manufacturers capable of supplying systems from the most simplistic to the most complex, in all weight categories and at most price levels.

The technology to build armoured vehicles is widely understood and not that difficult to acquire. That being said, design skills and systems integration capabilities are harder to come by. However, from a purely purchasing perspective, a potential customer will never be short of choices to meet an operational requirement.

If there is one world to describe the armoured vehicle environment in Europe since the end of the Cold War, then that word would be change. Back in the context of Cold War the operational environment in Europe was going to be a high intensity mechanised battlefield, with tanks and heavy armour as the weapons of choice. Then with the end of the Cold War, it was the end of history and high intensity conflicts were a thing of the past. As a result you did not need tanks and heavy armour so much. Instead it was all about rapid deployment and peacekeeping, so you wanted light armour. Then came the Revolution in Military Affairs (RMA) and digitisation, this was the wave of the future. After which it was the Medium Force and then with Afghanistan and Iraq it was an emphasis on protection against threats such as IED's.

Consequently for many European end-users there was a great deal of uncertainty over what they actually needed because it was difficult to develop any long-term plans in such an uncertain politico-military situation. Furthermore, defence spending was significantly reduced

across much of Europe as politicians sought a 'peace dividend' and then later had very little interest in military spending as there were few votes in it. Put it all

they once were. In sum, the European armoured vehicle sector can be characterised as being extremely complicated, both in terms of end-user operational requirements and in numbers of vehicles needed and in terms of the current state of the armoured vehicle industry.

The objective of this article will be to look at the current state of play in terms of armoured vehicle markets across Europe, starting with the traditional major ar-



(Photo: Forsvarvet Danmark)

A LEOPARD 2A5DK of the Danish Army on the NATO Trident Juncture exercise in November 2015. Denmark had 51 LEOPARD 2A4 tanks upgraded to the LEOPARD 2A5DK standard by KMW. A whole range of LEOPARD 2 upgrade programmes are currently underway in Europe demonstrating the continuing importance of the main battle tank.

together and this was hardly conducive to significant armoured vehicle procurement programmes.

That is not to say that armoured vehicle procurement has come to a grinding halt in Europe, indeed in recent years there has been a recovery in terms of acquisitions. However, the numbers of vehicles being acquired are significantly down on what would have been the norm in the pre-1990 era. The point that needs to be made is that there is still a significant armoured vehicle market in Europe and a diverse industrial base that is capable of meeting the demands of this market. Added to which European armoured vehicles remain competitive internationally, though perhaps not as competitive as

armoured vehicle users and their industrial circumstances. We will then broaden our analysis to cover markets and industries across the rest of Europe. Then our final port of call will be into the adjacent Middle East region looking at some newly emerging industries and at a few of the local vehicle requirements.

Traditional Powers

For our purposes the traditional powers as regards armoured vehicles in Europe are France, Germany and Britain. In December 2015 regulatory approvals were received for the merger of the activities of Krauss-Maffei Wegmann (KMW) of Germany and Nexter Systems of France,

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David Saw is a specialist defence writer based in Paris, France. He has a long and comprehensive record of writing and managing defence magazines at the highest level, from the USA through Europe to Asia, and is now a regular contributor to ESD.



(Photo: Nexter)

The Nexter Systems Véhicule blindé de combat d'infanterie (VBCI) entered service with the French Army in 2008 and a total of 630 vehicles have been acquired. In 2014 a new higher weight, 32 tonne, variant of the VBCI was unveiled and this led to the new VBCI 2 export variant of the system.

the resulting new company moves into the front rank of ground systems manufacturers in Europe. Inevitably it is a major player in Europe as both France and Germany are working on major armoured vehicle programmes and both companies are also highly competitive in export markets.

Dealing with France first, they are in the midst of a major refresh of their armoured vehicle fleet. The French Army has acquired 630 VBCI vehicles in standard infantry and command variants, with the system having seen operational use in Afghanistan, Lebanon and Mali. A new higher weight (32-tonne) version of the VBCI was officially qualified in October 2014 and it is hoped that this new variant will prove successful in the export market, where it is known as the VBCI 2.

Under the terms of the Scorpion programme the French Army is undertaking a major transformation programme which will see the upgrade of existing armoured vehicles and the acquisition of new generation vehicles to replace existing equipment. In terms of upgrades, Nexter has been awarded a €330 million contract to upgrade 200 LECLERC tanks and 18 DCL LECLERC (ARV variant). Deliveries are due from 2020 and the vehicle is expected to remain in service through 2040.

In December 2014 work commenced on two new generation armoured vehicle programmes in France both covered by the overall Engin Blindé Multi-Rôles (EBMR) programme, these are the Véhicule Blindé Multirole (VBMR), known as the GRIFFON, and the Engin Blindé de Recon-

naissance et de Combat (EBRC), known as the JAGUAR. This is a new family of 6x6 wheeled armoured vehicles, the GRIFFON will replace the VAB APC in the French Army, while the JAGUAR will replace the AMX10RC and the ERC90 reconnaissance vehicles, and the VAB HOT anti-tank system. Nexter Systems, Renault Trucks Defense (RTD) and Thales have formed what they describe as a 'temporary consortium' or GME to manage the industrial aspects of the programme. Deliveries are due to start in 2018, with nearly 2,000 vehicles due to be acquired under the terms of the programme.



(Photo: Thales)

A graphic of the JAGUAR Engin Blindé de Reconnaissance et de Combat (EBRC) on order for the French Army under the Engin Blindé Multi-Rôles (EBMR) programme. The JAGUAR will replace the AMX10RC and the ERC90 reconnaissance vehicles, and the VAB HOT anti-tank system.

RTD is an important part of French armoured vehicle capability, hence its involvement in the EBMR programme. Under the RTD umbrella you have RTD itself, Acmat and Panhard. RTD has the VAB Mk 3, a new 20 tonne vehicle, and a number of vehicle options based on the SHERPA platform. Panhard has the PVP and the widely used VBL available in a number of different variants, while Acmat has its BASTION family of light armoured vehicles. RTD aims its products at both military and security customers. Back in December 2014 KMW handed over the first upgraded LEOPARD 2A7 tank to the German Army out of an initial batch of 20 vehicles, this would then have set the scene for work to commence in 2017 at KMW on the upgrade of 205 more LEOPARD 2 tanks to the 2A7 configuration. More upgrade possibilities have emerged in Germany with the disclosure in April 2015 that the German Defence Ministry would spend €22 million to acquire 100 LEOPARD 2A4 tanks that had been disposed of as surplus to the German defence industry. Back in 2011 it had been decided that the Bundeswehr would have its tank fleet reduced from 350 down to 225 vehicles. With the 100 tanks being re-acquired, the Bundeswehr will be authorised to have a tank fleet of 328 vehicles. As yet there is no firm information on the inclusion of the 100 LEOPARD 2A4 tanks in the 2A7 upgrade programme.

On 18 December 2015 the first LEOPARD 2A7 tanks for Qatar made their appearance at the Qatar National Day Parade, in total six tanks were seen, mounted on tank

transporters. Qatar has 62 LEOPARD 2 A7 tanks on order with deliveries scheduled to be completed in 2018 according to reports. With upgrades and new production, the LEOPARD 2 will continue to be very important for KMW.

PUMA IFV, formally entered service with the Bundeswehr on 24 June 2015. Manufactured by PSM, a joint venture of KMW and Rheinmetall, a total of 350 vehicles are due to be delivered by 2020. Under the Artec banner KMW

December also saw Lithuania place an order for 88 BOXER vehicles, with a contract price ceiling of €400 million. The vehicles will be delivered between 2017 and 2019, with some having an Elbit turret mounting a 30 mm cannon and the Rafael SPIKE LR anti-tank missile.

The British Army has found itself travelling a difficult road as it seeks to reinvigorate its armoured vehicle fleet, which, at the moment, is over populated with a lot of underperforming legacy vehicles. That being said, there are some bright spots emerging in what for many years had been a rather disappointing picture. In October 2011 Lockheed Martin UK won the Warrior Capability Sustainment Programme (CSP) to upgrade 380 WARRIOR IFV with an in-service date of 2017. Then the long running Future Rapids Effects System (FRES) requirement achieved partial resolution through the 2014 award of a £3.5 billion contract to General Dynamics UK for 589 AJAX vehicles (SCOUT SV) to be delivered from 2017 to 2024.

There is still much for the British to do, the next major programme that is emerging is the Mechanised Infantry Vehicle (MIV), an 8x8 wheeled system. Large numbers of vehicles are expected to be purchased with solutions from General Dynamics, Nexter, Patria, Iveco and Singapore Technologies (ST) Kinetics likely to be evaluated. Although at this stage much work still remains to turn this requirement into a viable programme, plus doubts remain over the level of funding that is available. An effort to start a tank upgrade programme in Britain has begun to emerge in the form of the CHALLENGER 2 Life



The Artec BOXER had a very satisfactory month in December 2015, obtaining significant new orders. Previously Germany had ordered 272 BOXER vehicles and the Netherlands 200. In December 2015 Germany ordered an additional batch of 131 vehicles and then Lithuania ordered 88 BOXER, this will guarantee BOXER production until at least 2020.

Internationally other companies such as Rheinmetall have made themselves players in the LEOPARD 2 upgrade marketplace. As illustrated at the end of December 2015 when the Polish Army announced that it would be upgrading 128 LEOPARD 2A4 tanks, with an option on 14 more. The work will be carried out in Poland by PGZ (Polish Armaments Group) and Bumar-Labedy, with Rheinmetall as the strategic partner for what is known as the LEOPARD 2PL programme. The first prototype will be ready in 2017, then in 2018 Rheinmetall will upgrade six tanks, with all subsequent tanks being upgraded in Poland, with deliveries to be complete by 2020.

Beyond upgrades there are possibilities for a new German tank as a LEOPARD 2 replacement, leading to the name LEOPARD 3 being used. In May 2015 it was disclosed that the German government and defence industry were working on 'technologies and concepts' for a next generation tank, with this phase of the programme to be completed by 2020. As the LEOPARD 2 out of service date was originally intended to be 2030, the need for a successor vehicle will become more pressing year on year.

The replacement for the MARDER, the

and Rheinmetall are also partners in the BOXER 8x8 wheeled armoured vehicle programme. Germany and the Netherlands contracted for the vehicles in November 2004, with Germany taking 272 and the Netherlands 200. The last German vehicle was due to be delivered



The British now appear to have decided that they might want to work towards a CHALLENGER 2 upgrade programme to be known as the CHALLENGER 2 Life Extension Project (CR2 LEP). This will be the third effort to upgrade the tank since 2001, but as it has been decided that the CHALLENGER 2 will remain in service through 2035, an upgrade is essential.

in March 2016, but in December 2015 the Bundeswehr placed a €476 million order for an additional 131 vehicles to be delivered between 2017 and 2020.

Extension Project (CR2 LEP), this will be the third attempt since 2001 to get an upgrade underway. The aim of CR2 LEP is to upgrade 227 tanks and keep the vehi-



(Photo: UK Ministry of Defence)

Proof that it was possible for the British Army to acquire a new armoured vehicle came with the 2014 award of a £3.5 billion contract to General Dynamics UK for 589 AJAX vehicles (SCOUT SV) to be delivered from 2017 to 2024. The basis for the AJAX vehicle is the ASCOD design originally developed for Austria and Spain by Steyr-Daimler Puch and Santa Barbara.



(Photo: Forsvarvet Danmark)

A General Dynamics European Land Systems (GDELS) PIRANHA V vehicle taking part in Danish Army vehicle trials. Denmark would go on to select the PIRANHA V and intends to acquire 206 vehicles. The PIRANHA V will also provide the basis for a new 8x8 IFV for the Spanish Army with up to 300 vehicles required.

cles in service through 2035. There seems to be an acknowledgement that having a tank is a good idea, as ever whether there will be the money to pay for it remains the stumbling block.

Key Players

General Dynamics European Land Systems (GDELS) was formed in 2003, the three main elements were the former Mowag in Switzerland, Santa Barbara in Spain and Steyr-Daimler Puch in Austria. In addition there is GDELS in Germany

which builds bridging equipment and the GDELS facility in the Czech Republic, this was developed to produce 107 PANDUR II 8x8 vehicles for the Czech Army between 2010 and 2013. The Czech Army will be purchasing 20 new PANDUR II vehicles and intends to purchase five PANDUR II ARV variants.

The GDELS PIRANHA remains a dominant armoured vehicle in Europe, in April 2015 Denmark decided to acquire 206 PIRANHA V vehicles. The PIRANHA V will also provide the basis for a new 8x8 IFV for the Spanish Army with some 300 vehicles be-

ing required eventually. An R&D contract valued at €89.2 million has been awarded to GDELS Santa Barbara and once a production decision is cleared, the new vehicle will be manufactured in Spain.

The PATRIA AMV has also been a significant vehicle for European industry, being acquired by Finland and seven other countries. The major customer for the AMV is Poland who build it under license as the Rosomak, having ordered 997 vehicles with deliveries to be complete by 2019. PGZ has developed modernisation packages for the ROSOMAK and a range of new variants. Slovakia has purchased 31 SCPIO vehicles, using the ROSOMAK platform with a Slovakian TURRA unmanned turret, up to 66 Scipio vehicles are required. Other programmes in Poland include a new tracked IFV as a BMP-1/BWP-1 replacement, and the PL-01 fire support vehicle based on the Swedish BAE Systems AB CV90/120 design. Also noteworthy is a programme by Rheinmetall MAN Military Vehicles and PGZ to develop a new 6x6 vehicle for the Polish Army LOTR light armoured reconnaissance vehicle requirement. Should that be successful then both parties intend to market the vehicle to international customers.

Broadening Horizons

Thus far we have taken a limited look at some of the main programmes and systems in Europe, there are many more to consider. For example, Norway is upgrading its CV90 fleet and will embark on a LEOPARD 2 upgrade. Equally worthy of note is some of the armoured vehicle developments taking place adjacent to Europe, for example in Turkey and further into the Middle East.

Turkey has developed a highly sophisticated defence industrial capability, initially to meet its own needs, but now it has become a player in terms of export marketplaces. Key players include Otokar, FNSS and Nurool. Otokar is responsible for the ambitious ALTAY tank programme, while it has also developed the TULPAR IFV for an emerging Turkish IFV requirement, this potential requirement has seen FNSS develop their KAPLAN IFV design as a competitor. Thus far Turkish military and security requirements have sustained the armoured vehicle industry in Turkey. It will be the success of the ALTAY programme, perhaps accompanied by a new IFV, that could drive Turkish industry to the next level in export markets.

Worthwhile things continue to happen at the King Abdullah II Design and Development Bureau (KADDB) in Jordan, which



(Photos: Patria)

The XP is the latest version of the highly successful PATRIA AMV 8x8 armoured vehicle family which has been selected by Finland and seven other countries. This AMV XP mounts the OTO Melara 30 mm Hitfist turret. Poland remains the largest user of the AMV in the ROSOMAK version, a variant of which will be exported to Slovakia.

over the years has run a number of programmes to upgrade Jordanian systems, as well as producing vehicles including the early versions of the NIMR armoured vehi-

cle for the United Arab Emirates (UAE). In February 2015 KADDB signed a contract with the Paramount Group of South Africa, under which 50 of Paramount's MBOMBE

6x6 vehicle would be built at KADDB. The MBOMBE would also become the basis for all future 6x6 armoured vehicle programmes in the Jordanian Armed Forces and an obvious replacement for the 300 RATEL vehicles in Jordanian service.

We conclude with a brief look at some developments in Israel. Currently it is the MERKAVA tank and its Heavy APV derivative NAMER that are the primary local systems for the Israel Defence Force (IDF). Future programmes such as the EITAN 8x8 armoured vehicle are underway though. This 35 ton vehicle will replace the M113 in Israel and initial production is due to commence in 2020. A future tracked vehicle known as CARMEL is also in development, this will weigh some 32 tons and is due to be ready by the end of the 2020s, this could potentially replace tanks and other tracked vehicles in the IDF. ■

Middle and Far East Will Stay the Most Attractive Defence Markets

Nail Kurt

Flexible business models are the things that my company aims to bring to the international armoured vehicle market. We openly collaborate with local partners in the countries that have desire to develop and enhance in-country capabilities.

As one of the leading land systems producers in the world, FNSS's appreciated position in Saudi Arabia and in Malaysia did not occur all of a sudden. It took a long while for us to build trust and find a stable position within these countries. Our history with Saudi Arabia goes back more than a decade. In Malaysia we are approaching 15 years of trustful collaboration, and during this period we have signed four consecutive contracts. Because we managed to sign successful contracts, I can now say that these countries have become "home markets" for FNSS. At the same time FNSS has become

a local value for them. These countries are very pleased to be working with us, building a sustainable local business and producing a reliable product in-country. This is the pleasure of building upon mutual respect, goodwill, good service and of course good pricing. We are also very pleased to participate in a win-win partnership, bringing continuity to our business.

At IDEF 2015 in Turkey, a Joint Development Program Agreement was signed between the Turkish and Indonesian governments. Under this agreement, we will jointly develop a Medium Weight Tank for the Indonesian Army with our esteemed local partner Pt Pindad. We plan to begin joint serial production after successful completion of the development phase. Bearing in mind the negative impact of sharp decline in global oil prices, the Mid-



(Photos: FNSS)

dle and Far East will continue to be among the most attractive defence markets for the foreseeable future. Due to decreasing expenditures on defence, European markets are not that promising. In fact, the European armoured vehicles market – both for supply and demand – continues to be fragmented and disorganized. So we may expect that the European land armaments sector will face rationalization and consolidation to maintain competitiveness. The KMW and Nexter case is a good example of it. Harsh competition in international armoured vehicle markets will not be so surprising. ■

Author

Nail Kurt is CEO of the Turkish defence company FNSS.

The Driving Force

Tim Mahon

Armoured vehicles – both in their ‘fighting’ and ‘utility support’ guises, remain an item of high interest and activity in the world of military equipment procurement. Despite the prognostications of the turn of the century that the days of the armoured fighting vehicle (AFV) were numbered – and the virtual deposing of the main battle tank (MBT) as the self-styled ‘queen of the battlefield’ – the AFV persistently figures high on the list of assets and associated capabilities for any planning staff dealing with intervention, expeditionary warfare, peace support operations – even humanitarian support and disaster relief operations in some cases. The AFV is indispensable – for a wide variety of self-evident reasons.

That said, there is a significant evolution afoot in the domain, as proven by the wealth and breadth of requirements under development and requests for information or proposals emanating from national ministries of defence around the globe. It might therefore be said that the supporting industry – consisting of a well integrated supply chain of companies, large and small, numbering in the hundreds – is in a state of good health and reasonable certitude regarding the future. While not seeking to be alarmist, we suggest that is not necessarily the case. That is not to say the industry is not healthy – but there remains a high degree of uncertainty vis-à-vis the exact nature of the emerging requirements, due in large part to a complex equation that remains to be solved: how to balance flexible capability with affordability, and efficient resource management with an acceptable capability to generate the right force mix for a wide variety of potential operational roles. There is little point in having the most agile and flexible AFV resource in the world if it is inappropriate to the next intervention requirement, or if the vehicle is too heavy or unwieldy to be easily and rapidly deployed.

Changes in emphasis notwithstanding, the fundamental principles underlying AFV procurement – and the consequent focus of industry on research and development – remain constant. And the most constant, as well as the most difficult to resolve gracefully, is how to resolve the eternal triangle of characteristics any vehicle must have: the balance between lethality, survivability and mobility. A constantly changing mix, de-

pending on anticipated deployment and operational utility characteristics, the triangle persists in being a challenging conundrum for users and developers alike.

Recent experience in Afghanistan, however, and to a large degree the lessons learned from both large scale and small unit operations in Iraq, have informed a series of decisions regarding the nature of this requirements triangle. Although all three characteristics remain important, it would

federate General Nathan Bedford Forrest, one of the earliest proponents of the doctrine of mobile warfare – is paramount in the minds of planners who are basing their future capabilities on the requirements demonstrated by this recent experience.

It is worth examining, therefore, the way in which AFV powertrain and drivetrain developments are shaping modern capabilities, and the manner in which those developments are themselves being shaped by the



(Photo: FNSS)

FNSS displayed its KAPLAN-20 infantry fighting vehicle (IFV) for the first time at IDEF 2015 in Istanbul.

seem that the mobility issue has taken pole position – at least for the type of military operations currently envisaged, though there are proponents of ‘broad spectrum’ defence who hold that issues of territorial defence and the possibility for future set piece battlefield operations still demands emphasis be given to firepower and protection over mobility. Nonetheless, the ability of a strike or intervention force to provide commanders with flexible agility – the capability “to get there the fastest with the mostest,” in the immortal words of Con-

requirements that are changing in response to the evolution of a much wider threat envelope than previous generations of vehicles had had to cope with. There are convenient categories of system within which to frame such an examination: wheels or tracks; suspension systems; engines; and gearboxes. While no claim is made that the companies listed in the following sections are the only bodies active in their respective fields, their selection does show the diversity and extent of the armoured vehicle supply chain.

Author

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Wheels or Tracks?

One of the issues that has long plagued designers of the future force mix, as far as mobility is concerned, has been the difficulty of making a choice between wheels or tracks as the traction interface. If there is any certainty in the issue it is that the debate will continue to be as heated and passionate as it always has been; but there are strong indications – based on recent procurement and development activity, that wheeled vehicles are the AFV of choice, at least as long as planning remains focused on the type of expeditionary and small unit operations that have informed the recent experience already referred to. Added to this are lessons drawn from other operations, dating back to the engagements in Chad, Kosovo and Somalia, as well as current interventions in Africa and the Middle East.

The driving forces, so to speak, behind this apparent preference revolve around three interlinked issues: the necessity for rapid deployment; the tactical reach required of the vehicles; and the high tempo of likely operations – all three of which are influenced by the fresh approaches to Concepts of Operations that have been implemented in many nations since the end of the Cold War. Tracks are complex and vulnerable, goes



One of the new evolutions is this BOXER with a PUMA turret.

(Photo: KMW)

one argument. So, too, are wheels – at least from the perspective of vulnerability. In fact, there is a strong case to be made for the wheels being the primary target of any enemy trying to neutralise or immobilise a vehicle. Trying to minimise the profile or screen the vulnerable wheels and tyres from sight and therefore attack is a possibility, but both approaches carry potential penalties in terms of agility that many capabilities managers are unwilling to pay. The ideal compromise solution – providing the ability to rapidly change direction and maintain vehicular integrity even while under attack – consists of installing so-called 'run-flat' tyres, which do pretty much what their title would suggest.

Hutchinson Industries lays claim to being the world leader in the provision of run-flat systems, having supplied them to a wide range

of original equipment manufacturers (OEMs) and armed forces for over eighty years. The vehicles to which they are currently fitted represent a significant majority of the wheeled AFVs currently in service outside those nations equipped primarily with Russian and former Soviet/Warsaw Pact platforms, including the Nexter Systems VBCI, PATRIA AMV, General Dynamics STRYKER, PIRANHA, LAV and PANDUR series, KMW FENNEK, BOXER and the near ubiquitous High Mobility Multipurpose Wheeled Vehicle or 'HUMVEE.'

A run-flat tyre is not a simple solution from an engineering perspective. Hutchinson's experience in the complex mix of technical challenges has resulted in the development of a range of run-flats that offer significant resistance to ballistic and blast damage – the cause of a large percent-

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age of vehicular writeoff casualties suffering damage from improvised explosive devices (IEDs) in the Afghan theatre of operations, for example – as well as the ability to resist off-road impact damage in the inevitably rapid and less controlled egress from a kinetic or explosive incident. Equally important, however, is the inclusion of an internal 'beadlock' in the tyre system, a characteristic that provides the ability for the tyre beads to clamp immediately to the wheel rim at very low or even zero tyre pressure. This provides additional footprint for the tyre and additional traction in soft terrain such as sand, loose earth or mud. It is now common practice to fit runflats to military vehicles and the discussion has moved on to why rubber and not the cheaper composite solution. Rubber has three particularly significant advantages, as described by Tyron in more detail on page 20.

Aluminium wheels offer weight savings of up to 60% by comparison with more conventional materials. Overall vehicle weight features very high on the list of critical performance parameters required by the military, from the viewpoint not only of unit mobility and superior power to weight ratios but also from the supremely important requirement for airmobility, perhaps the most fundamental aspect of expeditionary warfare as recently practiced and foreseen. Here Hutchinson has a wealth of design and development experience which, coupled with its patented central tyre inflation system, which radically reduces the number and complexity of components, makes for a first class run-flat system. Proof of its efficacy can be found in the company's selection as preferred or mandated supplier in the range of vehicles mentioned above.

Polymer science is fundamental to the development of high performance modern tyre systems and here UK-based Runflat International can lay claim to a heritage of excellence in the application of science that dates back to the early days of the Industrial



(Photo: GDELS)

British FRES Special Vehicle

Revolution. Though only formed in 2001, the company's predecessors have long experience in the development of rubber and plastics materials and components for the most demanding applications.

The company's range of run-flat tyre systems features on a wide range of military utility vehicles already, for which the original design was specifically developed, but much of the strength of the brand comes from the proliferation of its systems in vehicles for other mission critical applications, such as riot control, domestic security, asset protection and emergency services.

Canadian company Soucy International is a long time developer and provider of track systems – not just for the defence market but also for the demanding (and high volume) agricultural market. The company has significant experience in the science of bonding metal and rubber components – a principal point of potential failure in track systems – which runs counter to proponents of all-metal track construction.

The issue with all metal tracks is one of quick wear, although BAE Systems have revealed in the past a system developed for the lightweight CVR(T) combat reconnaissance vehicle family that boasted endurance of more than double previous all-metal systems. However, in an age in which environmental considerations are now an integral component of military operations, the much higher levels of damage that all metal tracks inflict on roads and critical infrastructure such as bridges makes the rubber/metal combina-

tion track – as long practiced by Soucy – a vastly preferable option.

The former Diehl Remscheid of Germany is an acknowledged leader in the provision of high durability double pin track systems for a wide range of fighting vehicles and can lay claim to a heritage dating back to German leadership in AFV design and development from the 1930s. More recently, the company's track systems feature on the PUMA IFV, the LEOPARD 1 and 2 MBTs, the M113 armoured personnel carrier, the BV206 all-terrain vehicle in service with the Bundeswehr and the Indian Army's indigenously developed MBT, the ARJUN. After a brief sojourn as Diehl Defence and Land Systems the company was bought by KMW.

Suspension – but not of Disbelief

Equally critical – and arguably equally vulnerable – for the survivability of armoured vehicles are the suspension systems. Given the extremely rugged terrain and operating conditions that military systems designers must cater for, suspension systems need to meet the twin and perhaps mutually opposed criteria of being extremely robust as well as relatively simple to maintain and repair.

Ireland's Timoney Technology has specialised for over fifty years in the provision of robust and highly engineered suspension components and complete systems for mission critical off-road applications. The company's success rests on an enviable heritage of solutions for heavy vehicles in emergency services and security applications, as well as military vehicles. As well as designing and developing its own armoured vehicle for the Irish defence forces, the company works very effectively in customised development for specific applications, such as the Singapore Technologies BRONCO all terrain vehicle. Timoney has been the sole supplier of front and rear axles, the integrated transfer box and the track system final drive units for the BRONCO since 1999. Timoney suspension systems also feature on the unmanned CRUSHER ground vehicle, in which an unprecedented degree of wheel travel



(Photo: Archive ES&T)

Russian T-15 on Red Square.

provides the highest mobility of any vehicle in its class.

A name long known but rarely highlighted among British defence suppliers is Horstmann Defence Systems, which specialises in high precision suspension and rotary damping systems – the latter, for example, featuring on the US Army's M109A7 self propelled howitzer. The trademarked Hydrogas external suspension system features on vehicles as diverse as the British Army's CHALLENGER MBT and TERRIER combat engineer vehicle as well as the US NLOS-C self propelled gun. The Hydrostrut system equips both the Patria AMV and the BAE Systems M777 155mm howitzer – demonstrating the diversity of applications that solutions for AFVs may have for non vehicular but equally critical applications.

Targeting the potentially lucrative market for upgrading vehicular systems to offset capability gaps revealed by recent operational experience, Meritor Heavy Vehicle Systems in Troy, Michigan, offers the HMMWV Enhanced Mobility Upgrade System for the vast fleet of vehicles in service globally. Featuring a complete rolling chassis, ProTec High Mobility Independent Suspension cross car modules and MXL drivelines with upgraded brake systems, the package provides for increased durability and reliability, restoring and enhancing those capabilities which may have been lost as the vehicle weight

has been increased by incremental armour protection upgrades.

Also prominent in the increasingly active aftermarket sector – as vehicles are upgraded and enhanced to meet emerging capabilities requirements rather than adopting the more expensive and lengthy process of new platform acquisition – is AxleTech International. Boasting an extensive capability for customising precision engineered solutions for specific vehicle applications, AxleTech provides a full spectrum suspension and driveline service for OEMs and military end users alike.

Also offering a full spectrum service for driveline and suspension systems and components for demanding applications is Hendrickson, which has a global footprint the envy of many of its competitors. With a heritage dating back over a hundred years to fall back on, Hendrickson provides both the OEM and aftermarket sectors with proven capabilities and customised engineered solutions. The company's systems are fitted to a wide range of military support vehicles in service in large numbers with US and international military forces.

Horsepower, Environmental Impact and Economic Effect

When it comes to engines for AFVs, the disparities in development programmes outweigh the similarities to a surprising degree.

The comparison between states of advancement in diesel technologies, for example – the “diesel vs JP8” debate – place the United States behind Europe in terms of states of the art. To a degree, given the relative costs of fuel historically, this is perhaps unsurprising, but as the fossil fuel debate continues to intensify and environmental pressures begin to affect even the mighty American war machine, that situation must perforce change. However, in a demonstration that the world of defence marches to the beat of a political drum on occasions, the US Army has recently been engaged with Congress in a spat over whether or not to replace the engine for its fleet of over 6,000 Abrams MBTs (a large number of which sit idle and degrade gradually as a result of a lack of current operational requirements) with a modern, fuel efficient one. Since the specific fuel consumption of the Abrams runs something in the order of three gallons per mile (that is not a misprint) a fuel efficient engine would seem to be a sensible initiative. The Army, though, adamantly maintains it has no need for such a programme, and no funding to resource it, pointing out the legion of other programmes that would have greater beneficial effect on maintaining and enhancing the operational role mandated by those same politicians who espouse the re-engining programme.

However, all is not rosy from a European perspective either. Stalled programmes, in-

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adequate engineering and 'mission creep' in terms of changing requirements specifications have all been characteristic of recent armoured vehicle programmes in Europe, with Britain's CHALLENGER 2 Life Extension programme a glaring example.

Intended to breathe new life into a perfectly capable but somewhat antiquated MBT, the CHALLENGER 2 LEP was at one time rumoured to centre on a brand new MTU powerpack, which would have radically altered the vehicles potential performance.

the company's range of transmissions and driveline systems is legitimately described by its marketing department as comprehensive. Like many of its peers, the company also recognises the considerable demand in the aftermarket sector for upgrading AFV performance by replacing antiquated transmissions with modern, capable systems. Renk France has developed and is in series production for the ESM350 transmission, specifically designed for upgrading the capabilities of the T-series Soviet-era MBTs, of

operations to be joint operations in the future. That means we need to drive commonality, interoperability and much greater flexibility to accommodate future technological advances in platforms that may have to last thirty years or more."

Which carries with it the inevitable consequence that the military desperately needs to take more advantage of the technologies and practices that have come to dominate the world of non-military systems. In the last fifty years, the ownership of advanced technological research and development has shifted from being government centric to industry. Samsung, for example, invests up to \$8 billion annually in science and technology: Facebook is devoting sums simply unavailable to government entities in facial recognition technologies. So leveraging the work that has already been done and the resources already invested becomes a necessity – not a preference.

Some areas of the defence world have already recognised and begun to take advantage of this phenomenon – notably the training and simulation community, where much of the fidelity and realism provided by tactical engagement simulators, for example, find their origins in the entertainment industry: the incidence of so-called 'serious games' technology in military training has become almost universal. So other sectors of military activity need to follow suit.

Which need not be that difficult. Almost every one of the companies mentioned in the preceding pages has an active and profitable business outside the military sphere. For some of them, defence business is, if not an afterthought, then certainly a peripheral activity to their mainstream business. The requirement is rapidly becoming one for the defence community to accelerate the process of so-called acquisition reform that is much trumpeted but sometimes implemented at a glacial speed.

Which is a plea, perhaps a vain one, but nonetheless sincere. The discussions at conferences such as the International Armoured Vehicle Conference and Eurosatory this year will undoubtedly – and quite legitimately – focus on the capabilities, characteristics, performance and requirements of AFV and military utility vehicle powertrain and drivetrain solutions, their impact, potential operational and cost effectiveness. That, however, should not necessarily be the only driving force. Partnering, collaboration, smart procurement, acquisition reform and closing the door on "business as usual" must also figure on the agenda. To fail to do so runs the risk of perpetuating the sad litany of delayed, cancelled or ineffective programmes and we owe the military so much more than that. ■

(Photo: Diehl)



IFV PUMA with Diehl rubber tracks

However, budgetary constraints and programme timing issues meant that Caterpillar was contracted to remanufacture the existing engines in 2014. The other aspects of the programme, including the selection and installation of systems that would enable the user to take advantage of the limited mobility enhancements provided by the remanufactured engines, remain unresolved currently, with solutions unlikely to be agreed for up to a further two years, according to some sources.

Having failed to convince British authorities to 'repower' CHALLENGER 2, MTU nonetheless sees this as a legitimate and potentially beneficial market sector. Providing the engines for vehicles as diverse as LEOPARD 1 and 2, India's ARJUN and Israel's MERKAVA MBTs, the PIRANHA series, Argentina's TAM medium tank and the Tatra T815 military truck, the company is working hard to exploit the upgrade and replacement market offered by the fleet of over 250,000 Detroit Diesel 2-stroke engines worldwide, a range for which it became the sole owner in 2006. Germany's Renk AG has 140 years' experience in the design and manufacture of transmission products and systems, with in excess of 50 years dedicated solely to military transmissions. Equipping a wide, not to say bewildering range of vehicles from the LEOPARD, MERKAVA and ARJUN MBTs to a host of lighterweight AFVs such as the German Army's new PUMA combat vehicle,

which in excess of 30,000 remain in service around the world.

More interestingly, though, Renk is also working hard at both electric and hybrid transmissions, which hold considerable promise for capability enhancement and efficiency for almost the entire gamut of AFVs and a wide range of utility vehicles. The demands for high load electrical power in modern AFVs have increased almost exponentially in the last two decades and the emergence of hybrid solutions such as Renk's REX Drive may mark a new era in the efficiency played by this important but often almost invisible aspect of AFV performance. Also prominent in German AFV driveline technology is ZF. Quite apart from being present on a majority of the AFVs manufactured in Europe in the last 30 years, the company has also been a pioneer of hybrid transmission systems and invests heavily in the research and development of the software that drives much of the efficiency gains to be had in adopting hybrid technologies.

Conclusions

What does all this mean for the user and for the supply chain, however? As one senior US officer said at a recent conference, "There are a number of certainties we can identify right now, two of which revolve around budget austerity as a norm – get used to it – and the requirement for all

Situational Awareness in Armoured Vehicles

Tamir Eshel

For decades, a good sight and a set of vision blocks were all that the crew needed to use their armoured vehicles' firepower.

The commander and gunner were both looking towards where the gun pointed. Standing up in his cupola with hatch open, the commander gained a panoramic view of the battle area; a pair of binoculars provided target acquisition and threat assessment, and vision and hearing provided all the situational awareness needed.

the vehicle, through rocket-propelled grenades fired from ambush at close range, to snipers that can hit the commander in the head from 1,000 – 1,500 metres, anti-tank missiles launched from up to 6,000 metres away, and sensor-fused weapons attacking from above. This new battlespace often has no front line. Dismounted and hidden, sometimes

long as they can offer their crews and transported troops the protection they need to carry out their mission. Assuming that the platform's armour protection is sufficient to ensure the vehicle's battlefield survivability and mobility, situational awareness is the key to bring on-board firepower into effect.

The Commander's Point of View

Long before asymmetric warfare became the norm, tank crews had to deal with new weapon capabilities that demanded more than guts and good eyesight. The introduction of high-explosive anti-tank (HEAT) anti-armour weapons, such as guns and infantry weapons, presented new threats for armoured vehicles as both tanks and AFVs met dissimilar opponents – much more vulnerable but also more elusive and well-adapted to complex terrain.

To survive and win against the new threats, tank crews had to increase their target handling capability. New electronic vision systems that matured with the television revolution of the 1960s offered tank commanders an independent sight for the first time. By the 1980s, stabilized cameras decoupled the commander's and gunner's lines of sight, and new systems enabled the crew to operate as a 'hunter-killer' team, where the commander assigns targets for the gunner to handle, while searching for others.

Today's independent commander's sights represent much more than a single sensor – integrating TV and thermal imagers for day and night operation, with high power zoom for long range operation. Mounted on an independent gimbal, these sights enable the commander to lock on a specific target while on the move, regardless of the turret's position, vehicle inclination or gun elevation. Laser rangefinder and stabilization techniques enable seamless operation on the move. Typical examples are Raytheon's CITV used on the M-1A2 and Independent Thermal Viewer used on the BRADLEY. The new British AJAX uses the ORION sight from Thales. Elbit Systems' COAPS



(Photo: U.S. Army)

Raytheon's Commanders' Independent Thermal Viewer (CITV) on a M1A2

Today's armoured warfare is different. Engagements between opposing armoured formations mutated into an asymmetric conflict between dissimilar forces. Armoured formations are often faced with an 'empty battlefield', where targets or threats are invisible or hidden. The challenges range from roadside IEDs or buried mines exploding a few metres from

even within civilian groups and crowds, the asymmetric enemy can attack from any direction, seeking the target's weakest, blindest spots. Precision-guided weapons enable dismounted troops to exploit those areas of vulnerability from relatively safe distance.

In classical symmetrical warfare armoured formations have clear advantages over a dismounted enemy, but unconventional, covert tactics provide the opponent with the element of surprise. Armoured vehicles that can take the first hit and remain functional can respond forcefully and eliminate the enemy on sight, as

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(Photo: Tamir Eshe)

The new AJAX (SCOUT SV) unveiled at the recent DSEI exhibition shows a number of optronic surveillance, target acquisition and threat warning systems, integrated on board. The commander's and gunner's sights are housed in protected cupolas equipped with ballistic protective shutters. Four laser warning sensors are also installed, to provide early warning from lasers. Acoustic hostile fire detection is also used.

and Sagem's MPS represent the latest range of independent sights that mount on elevated pedestals providing faster response and higher degree of freedom, full rotation and elevation.

In addition to the narrow field of view necessary for target identification some of the sights also provide wide area coverage for broad area surveillance: in order to improve target detection and acquisition, sensor fusion, automatic target recognition (ATR) and auto-tracking are employed, enabling effective multi-target handling. Some systems also use a laser pointer, enabling better coordination between forces.

Some sights are also equipped with kinetic capabilities – machine guns or missiles, enabling the commander to engage targets immediately, on detection. Typical examples are the 'BATTLEGUARD' from Raytheon and the UDP T05BV-1 Remote Weapon Station (RWS) used on the latest Russian T-90SM. Another variant is mounted on the remotely operated turret of the new Russian T-14 ARMATA main battle tank, both developed by the Russian company Uralvagonzavod.

Panoramic Vision

Periscopes have been used in armoured vehicles since the first tanks saw battle in 1916. While providing essential vision from within the armoured capsule, periscopes, or vision blocks were also always vulnerable, drawing sniper fire aimed to disable the crew inside the steel beast by impairing their vision.

Today's periscopes are made of glass or acrylic materials, built to resist bullets and shrapnel. They can also be fitted with laser protection filters, protecting the crew

against blinding laser energy. While ballistic protection is provided, a bullet impact would often shatter the glass and disable the block. To minimize the damage, outer protection layers are now available for periscopes and optronics. For example, the German company CeramTec offers a thin transparent plate made of ultra-hard 'Perlucor' spinel. This new material can be applied to existing transparent armour or lenses, significantly improving ballistic and scratch resistance.

Modern periscopes like the Embedded Image periscope (EIP) from Kent Periscope Systems' are integrating embedded display screens, showing sensor images, maps etc. These devices offer a versatile

solution for AFV drivers, eliminating the need for separate night vision solutions.

Thermal Vision

Improving the driver's vision and situational awareness under closed hatches is a must. Driver's Thermal Systems (DTS) have been used for many years, but more recently these independent sensors have been merged into comprehensive viewing systems supporting the entire crew. As long as the thermal vision technology was dominated by expensive, cooled sensors their use on armoured vehicles was limited to the priority tasks of surveillance and target acquisition. But with the increasing availability of cheaper, uncooled thermal sensors these sensors often augment TV/CCD cameras, adding day/night capabilities, with the ability to overcome certain types of obscurants and counter-measures.

Some examples are the ThermoVision camera from Flir Systems that comprises a thermal camera and a colour TV camera. This system is also fitted with a protective shutter that also functions as a lens-cleaning device. The visible channel can be blended with the IR picture, to enhance situational awareness.

Thales offers a different solution – the remotely operated crew vision enhancer sensor that offers 360 degrees situation awareness using a dual Thermal/LLTV sensor. Using only two sensor blocks in addition to the driver's thermal viewer, the system uses an internal pan mecha-



(Photo: CeramTec)

The Perlucor® material from the German company CeramTec is less easily scratched compared with glass and can be applied to existing transparent armour or lenses.

nism to focus on an area of interest within a 180-degree field of view.

DRS Technologies' Enhanced Situational Awareness (ESA) System also uses the company's Driver's Vision Enhancer (DVE) wide camera module to expand the driver's field of view. The DVE combines three 17 µm uncooled infrared cameras to output a stitched 107° x 30° field of view video. The driver can electronically



(Photo: DRS Technologies)

The Driver's Vision Enhancer Wide (DVE Wide) of DRS Technologies is the heart of the Enhanced Situational Awareness (ESA) System.

pan through that field of view, for example to see the road edges on both sides. Adding a rear camera enables intuitive and safe driving in reverse as well.

To be effective and functional in combat, situational awareness elements must be easy to use, reliable and survivable. Therefore, cameras are encased in low silhouette, armoured installations or buried inside the armour. Examples of this have recently been displayed by FNSS on the new KAPLAN Armoured Vehicle, and have been brought to market by specialist companies such as KTK (see box). Redundancy is also a key factor for a successful, combat-worthy system but above all, the system must be useable.

The KTK Kommunikationstechnik / RFEL flexible Driver Vision System (fDVE) delivers real time HD vision systems and FPGA-based video enhancement solutions for day and night vision including thermal fusion and image stabilisation. The solution has been integrated with Rheinmetall's AMPV (Armoured Multi-Purpose Vehicle). KTK already deliver the infrared (IR) lights and rear view cameras for the AMPV.

The driver vision enhancement system uses the MIL Spec thermal LWIR SAPHIR® core from Rheinmetall as well as a CCD/CMOS Full HD core from Adimec's TMX series. Night vision cores (EMCCD/sCMOS) or SWIR cores can be integrated into the overall solution as well.

KTK and RFEL showcased their joint solution in September 2015 at MSPO and at DSEI, together with KTK's 9" Full HD rugged display.



(Photo: Rheinmetall)

Rheinmetall's AMPV includes advanced situational awareness sensors

Elbit Systems, the pioneer of the 'See-Through Armour' (STA) concept, has further evolved situational awareness efficiency under closed hatches. Elbit's system displays a seamless 360-degree panoramic view generated by multiple cameras positioned outside the vehicle, integrated with on-board battle man-

agement systems, threat warning and fire control Systems. STA employs powerful image processing tools to provide a clear battlefield view without compromising crew safety. STA superimposes essential tactical Information on-screen, enabling the crew to respond quickly to evolving situations. To enhance the





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crew's situational awareness, STA simultaneously displays both the 360-degree panoramic image and enlarged region of interest.

(Photo: U.S. Army)



Vehicle-Mounted V-AMMS by Microflown. Sensor is above the driver.

Acoustic Hostile Fire Indication

Having a clear picture of the outer scene is not enough. One of the most critical aspects of combat situational awareness is the rapid identification and location of the enemy, particularly under a surprise attack.

Most fire events have distinctive signatures, characterised by flash and blast. Dedicated Hostile Fire Indication (HFI) sensors can pick up these visual and acoustic signatures to trigger an alarm and pinpoint the threat. Typically HFI would trigger an alarm when detecting effective fire from snipers, small arms or medium/large calibre guns. Some can also warn on mortar, RPG or guided missile attack.

Battle tested acoustic sensors like the French PILAR from Metravib and BOOMERANG from Raytheon BBN are among the most common for these applications. These sensors use a tetrahedral acoustic array mounted on a mast above the vehicle to detect the noise caused by the supersonic bullet passing within about 30 metres of the sensor. This signal is compared a moment later with the muzzle blast, travelling from the shooter's location at the speed of sound. The time difference between the two signals determines the distance, while further processing determines the direction of arrival of the projectile, hence estimating the source of fire.

(Photo: Lucid Dimensions)



THUNDERBOLT™ HFD of Lucid Dimensions integrates acoustic and thermal sensing technologies.

A different acoustic HFI recently introduced by the Dutch company Microflown Avisia is the Vehicle Acoustic Multi-Mission Sensor (V-AMMS). This system uses the company's proprietary Acoustic Vector Sensor (AVS) technology, measuring the directional velocity of acoustic particles. Compared with acoustic arrays, V-AMMS is smaller and more accurate. Moreover, its lower profile does not obstruct observation and firing. Microflown recently introduced the airborne variant of the AMMS, opening the way for helicopter- and UAV-mounted shot detection, amongst other noise-profiling capabilities.

Infrared & Radar Threat Detection

While acoustic sensors offer an affordable solution they can be too slow to respond. They can also find it difficult to cope with multiple, simultaneous fires or echoes encountered in dense urban topography or mountainous terrain. Furthermore, while effective against supersonic projectiles they are generally unable to detect subsonic threats such as anti-tank guided missiles. (The Microflown V-AMMS software can detect subsonic threats, and in a networked solution can both detect and localise.)

To overcome these limitations additional sensors are used as stand-alone HFIs or in addition to acoustic systems. For example, L-3's CROSSHAIRS (Counter Rocket-Propelled Grenade and Shooter System with Highly Accurate Immediate Responses) integrates the company's Mustang Technology radar sensor with Raytheon's BOO-

(Photo: IDF)



Israel's MERKAVA Mk4m is equipped with the TROPHY active protection system. The system's radar (developed by IAI Elta) also adds situational awareness to the crew.

MERANG, to reduced the false alarm rate, together with an Enhanced Position and Location Reporting System and Remote Weapons Station. Providing early warning against bullets, RPGs, guided missiles and mortars, CROSSHAIRS delivers the geolocation of the shooter, enabling rapid response from the integrated RWS.

Other detection methods rely on faster and more accurate electro-optical sensing. Although infrared detection systems are more expensive than acoustic systems, they remain functional in urban terrain, provide higher accuracy and offering better threat classification.

These systems also use sensor fusion to reduce false alarms. For example, IAI Elta Systems OTHALO uses a Short Wave Infrared (SWIR) sensor to detect the muzzle flash (launch) and a Charged Couple Device (CCD) operating in the visible spectral band. Overlaying the two images helps to cancel non-fire events such as glare, lights and explosions.

A different infrared sensor is the THUNDERBOLT HFD from Lucid Dimensions. This system employs the ShotSense 3D Spherical Detection (S3D) system – a three-dimensional matrix of IR detectors that integrates acoustic and thermal sensing technologies. According to the developer, Thunderbolt can instantly detect and locate almost any type of weapon fire event, from small arms to rockets, by distinguishing the heat signature of specific weapons' discharges. As in other integrated sensors, sensor fusion increases the systems' ability to reject false alarms.

SPOTLITE M from Israel's Rafael Advanced Defense Systems employs uncooled thermal sensors operating in the 3-5µm spectral range to detect fire events. While using a single sensor, SPOTLITE effectively rejects false alarms through powerful signal processing algorithms, which also enhance detection and classification performance. In recent tests the system demonstrated these capabilities by identifying simultaneous firing of guns, small arms and RPGs, while rejecting irrelevant events caused by battlefield explosions.

Three units of SPOTLITE M provide full hemispheric coverage for a combat vehicle, providing early warning in multiple, simultaneous firing events of small arms, RPGs, guided missiles and rockets. The system delivers nearly instantaneous indications and geolocation of firing events, at pixel size accuracy, enabling rapid counteraction.

What differentiates the SPOTLITE from other hostile fire indicators is its ability to cover a wide area. This 'battlespace awareness', along with image-based

targeting capability (exploiting Rafael's geo-pixel-based MATCHGUIDE protocol), enables just a few SPOTLITE sensors to provide effective protection for a larger tactical formation. At a higher tactical level (platoon, company, battalion) enemy location coordinates are transmitted to all members within seconds.

Active Protection System (APS) Radars for Situational Awareness

Some threat radars that function as sensors for modern active protection systems also provide essential threat awareness, providing vital information about threats in real time. Upon detection, identification and assessment of a threat the radar delivers early warning to the crew, indicating the direction and elevation of an

can also be used for self-protection and ground surveillance, securing the vehicle while stationary. In self-protection mode, the radar systems detect and automatically track Anti-Tank Rockets (ATR), Anti-Tank Guided Missiles (ATGM), tank rounds and mortars.

Another radar developed for APS is the Compact Hemispheric Radar (CHR) a solid state, digital phased array from Rada. This armoured, wall-mounted system is also offered in two versions – the RPS 10 is optimized for APS.

The RPS-15 is positioned as a 'hostile fire management radar' system for combat vehicles. This radar detects tracks, classifies, and locates direct and elevated threats to combat vehicles. Hemispheric coverage is achieved by the simultaneous operation of either three or four identical and interchangeable radars, each cover-



(Photo: BAE Systems)

BAE Systems' Battlview 360 display displays the outside view as seen by the panoramic camera with overlaid navigational and tactical data layers.

incoming projectile, projected point of impact (POI) calculated Time-To-Impact (TTI) and, if possible, the point of origin (POO), enabling the crew or other networked combat support elements to attempt to counter the threat. The radar continues to track all identified targets while searching for others, supporting the vehicle's crew and tactical formation with battlespace awareness. The information provided by these radars automatically activates reaction systems such as the hard- or soft-kill protection systems operating on board. IAI Elta Systems has developed two variants of such radars – the combat proven ELM-2133 WIND-GUARD, which is part of Rafael's TROPHY APS, and the new ELM-2135 STORM-GUARD dual-mode radar. The two radars are both digital, staring, active, electronically scanning array radars. A dual-mode sensor, the 2135

ing 120° in Azimuth and 70° in Elevation. The system can be integrated with existing Battle Management Systems (BMS), displays and data links onboard the vehicle using standard Ethernet interfaces.

Beyond Situational Awareness

Modern information and display systems are now available to filter and process the endless stream of information that constantly bombards modern battlefield platforms, and present the crew with the important, relevant, and clear information they need for their mission. In addition, once threats are detected, the indication must be instantaneous, clear and relevant, to enable an effective response. The introduction of independent viewing systems can complicate orientation for crew mem-

bers seated inside the vehicle, as objects or targets they see on their screens may not be aligned with the direction they perceive. BAE Systems has introduced a conceptual display called 'BATTLEVIEW 360' that attempts to resolve crew situational awareness difficulties in complex terrain. The system provides crewmembers with a real-time, 360-degree view of their surrounding, indicating important objects such as safe route and movement directions, friendly forces' locations and identification, communication data and battle plans. According to the developers at BAE Systems Hägglunds, crew workload is reduced with the system, as they can make fast, yet effective decisions, resulting in increased battlefield effectiveness and survivability.

At its core, BATTLEVIEW 360 is a digital mapping system BATTLEVIEW collates, displays, and tracks the positions of all

surrounding features of interest in two- or three-dimensional mode vision. The head-worn part of the system can be synced to the vehicle's cameras to provide a 'see-through' capability in both visual and infrared. Dismounted soldiers will also be able to use the system to relay information back to the vehicle.

BATTLEVIEW 360 employs a head-down touch-screen display to allow commanders to quickly assess information and make informed and efficient decisions for targeting or other purposes. It also allows the commander to view the display of other crewmembers, such as the gunner.

Similar systems are available or under development elsewhere.

Conclusion

Vehicle situational awareness is fundamental to the survivability of armoured

vehicles in modern theatres of operations. This is not only a consequence of asymmetrical warfare and increasingly urbanised operational areas, but also because of the increasing lethality of hostile anti-armour weapons: and it applies as much in the desert, bush and jungle as in the city. The key target is often the undetected one. Awareness is also called for in the engagement of multiple targets, without which a vehicle's self-protection systems and offensive armament can be relatively quickly overwhelmed. Equally, dismounting disoriented troops into a killing zone is both possible and fatal without appropriate situational awareness. Systems and resources are available, and the scope of capabilities widens each year, but those capabilities can no longer be viewed as add-on extras, or options, and must be factored into the vehicles' core requirements at an early stage. ■

Rubber or Composite Runflats for Military and Off-Road Vehicles

It is now common practice to fit runflats to military vehicles and the discussion has moved on to why rubber and not the cheaper composite solution. Rubber has three particularly significant advantages.



Figure 1 showing how a rubber runflat ensures beadlock.

Firstly rubber absorbs shock from impacts with curbs, pot holes and generally operating in a hostile environment. Rubber drastically reduces the vibration and stresses transmitted through the runflat to the wheels, axles and drive shafts, with little change to the handling of the vehicle whilst retaining a degree of comfort for the driver and passengers. Secondly rubber is compliant and prevents damage caused to the tyre from impingement between the runflat and the inside of the tyre.

The third less obvious reason for using rubber rather than composite and probably the most important is the need for "beadlock".

Without adequate compression of the tyre beads against the flanges of the wheels (beadlock) the vehicles are going nowhere. With only the "drag" from the deflated tyres, the wheels will rotate inside the tyres – and that is on level ground, let alone trying to negotiate any obstacles or hills.

So why not use composite or hard material for beadlock? The answer is in the manufacturing tolerances of the wheels and tyres. According to Michelin there is a bead tolerance of $\pm 3\text{mm}$ on all their 20" military tyres, which produces a total bead variance of 12mm. Add to this the wheel tolerances and there is variance of up to 20mm.

Composite runflats have to be under manufactured across their width, otherwise the runflat will break during installation or the wheel will not seal properly and therefore it is impossible to guarantee adequate compression to prevent the tyres from slipping or spinning on the wheels.

The width of the rubber runflat however is over-manufactured to allow for these tolerances and during the installation, the rubber will flex and compress the tyre beads against the flanges of the wheels guaranteeing the beadlock, as in figure 1.

In 2008 Tyron invented the world's first ever multi piece rubber run flat All Terrain Runflat (ATR) insert which can be fitted in the field, without special tools, to both military split rims and ordinary tubeless wheels, giving excellent off road capabilities. These have been both ballistically tested and for endurance to demonstrate that the vehicle can keep moving for more than 100 km at speed. ■



Tyron has developed a range of All Terrain Rubber Runflats and associated systems.

PIRANHA 5

The Multipurpose Armoured Platform Solution for the Future of Danish Defence

The PIRANHA 5 from Swiss based GDELS-Mowag has been selected as the Danish Army's new main tactical vehicle. It is to accomplish missions throughout the full spectrum of the operational environment, from high-intensity combat through to humanitarian missions in a wide array of climatic conditions and terrains and in response to multiple and diverse threats. Therefore flexible, highly mobile and agile APCs are required.

The Danish Defence force has a need to replace the Army's fleet of armoured personnel carriers (APCs) currently in use in combat units, combat support units and service support units, i.e. in nearly all parts of the Danish Army.

that has produced around 17,000 wheeled armoured vehicles, of which about 11,000 – including LAV and STRYKER – are part of the PIRANHA family.

The economies of scope and scale associated with this extensive PIRANHA operator base contribute not only to the affordability of the vehicle platform but also to the reduction of life cycle costs. Therefore the PIRANHA user can rely on unmatched experience. The technology implemented has been subject to continual enhancement and the PIRANHA 5 is one of the most modern armoured wheeled vehicles on the market today. The combat proven platform with superior mobility, a modular protection system and high reliability has been deployed

Most of today's combat operations demand higher levels of survivability and capacity than was previously provided by wheeled armoured combat vehicles. This results in customer demands for vehicles with significantly more payload in order to provide higher levels of protection against mines, IEDs and ballistic threats. GDELS responds to these requirements with the PIRANHA 5, which will provide higher survivability and a world-class internal volume and capacity combined with the mobility and reliability that the PIRANHA is known for.

GDELS-Mowag's design philosophy takes both the experience gained from internal testing and user nation operations into account and considers the lessons learned for



PIRANHA 5 in Danish Army colours



PIRANHA 5 with Kongsberg weapon station during desert trials

After more than three years of evaluations, which included a trial period of several months, the Danish MoD announced that the PIRANHA 5 from GDELS-Mowag was the most economical and preferred bid.

The procurement effort comprises the acquisition of between 206 and 450 APCs in six different configurations (Infantry, Command, Ambulance, Engineer, Mortar and Repair), a variety of interconnected deliveries such as spares, training and documentation, and is also supported by a sustainment contract according to which the PIRANHA 5 can be supported and fully operated for its entire life cycle.

The PIRANHA 5 is one of the latest members of GDELS-Mowag's family of combat-proven wheeled vehicles, which are in service with almost 20 different customer nations worldwide. GDELS-Mowag is part of the General Dynamics Corporation, one of the world's largest defence industries

in all terrain and climatic zones, including amphibious operations. The PIRANHA 5 will provide the Danish Army with the flexibility of a standardised multipurpose armoured platform for all units, and this will increase the tactical redundancy in operations and minimise the logistical footprint.

system enhancements and future vehicle designs. Accordingly, the PIRANHA 5 incorporates experience from four decades with more than 11,000 vehicles in over 40 variants, fielded in 19 armies globally and with over 40 million km of deployments in various theatres of operation.



Turreted version during winter trials

(Photos: GDELS-Mowag)

The Perfect Shield?

Armour Evolution and Development

David Saw

To be sacrilegious, successful armoured vehicle design comes from the correct balance between a “holy trinity” of factors. Those factors traditionally being firepower, protection and mobility. Over emphasising one of these characteristics at the expense of another can lead to a vehicle with inferior operational performance. In this article our interest is on one part of the “holy trinity”, that part being “protection”.

There actually is no standard right or wrong answer when discussing what is necessary for an armoured vehicle to meet an operational requirement. In the

role for doctrine in all of this, obviously if you want an air transportable vehicle because strategic mobility is vital, you are not going to be stressing high levels

cessor to the highly successful CENTURION tank in the British Army. The Franco-German effort fell apart due to a number of unresolvable differences



(Photo: Rheinmetall)

The German Army is taking the PUMA IFV into service to replace the venerable Marder system. Puma can support three levels of protection, the baseline level gives the vehicle a weight of 31.45 tonnes, while with the top level of protection Puma weighs 43 tonnes.

end it comes down to what the customer is prepared to accept in terms of the system in question, and what the customer is prepared to pay for it. There is also a

of protection because you will not be able to accommodate the weight penalty required.

The importance of doctrine should not be underestimated, a good example of this comes in the form of three tank designs that originated in the 1950s and entered service in the 1960s. The tanks in question were the AMX-30 in France, the LEOPARD 1 in Germany and the CHIEFTAIN in Britain. The roots of the AMX-30 and the LEOPARD were actually a joint Franco-German development programme for a new generation tank, while the CHIEFTAIN was to be the suc-

cessor to the highly successful CENTURION tank in the British Army. The Franco-German effort fell apart due to a number of unresolvable differences in areas such as firepower and mobility, the end result being two separate national programmes. One of the issues that was key was weight/protection, the French belief was that mobility would equal protection and so in-service AMX-30 weighed 32.5 tonnes. The German solution was to still have a vehicle that was lighter than many tanks of the era, but one which had a useful level of protection. Thus the LEOPARD 1 would have a weight of 40 tonnes when it entered service. For the British the solution was different, to them protection equalled mobility and this resulted in the

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CHIEFTAIN having an initial weight of 56 tonnes.

Combat Weight and the Proportion

If you were to look at the combat weight of current generation tanks and the proportion of that weight that is accounted for by protection, it would appear that those who subscribe to the protection is mobility school of thought have been vindicated. Of course this did not happen in isolation, you needed to have gains in automotive performance, suspension systems and related areas to be able to accommodate all of this extra weight.

Thus far tanks have been able to support weight growth in order to enhance protection levels, though there comes a point where the law of diminishing returns comes into play and excessive weight hampers mobility and deployability. Finding protection solutions for other categories of armoured vehicle is not as straightforward though. Additional protection significantly impacts on mobility and limits operational utility as demonstrated by US Army experience with the Stryker in the early years of their involvement in Iraq.

In an ideal world an operator would be able to add the desired level of protection to an armoured vehicle to fit the operational environment. The German



(Photo: US Army)

STRYKER vehicles of 4th Squadron, 2nd Cavalry Regiment, US Army take part in the Polish Armed Forces Day Parade in Warsaw in August 2015. Adding protection to the Stryker to operate in Iraq and Afghanistan impeded vehicle performance and maintainability according to a number of reports from the field.

Army PUMA IFV can be equipped with three different levels of protection to meet the threat levels anticipated, the standard variant of PUMA weighs in at 31.45 tonnes, with the variant with the maximum level of protection having a weight of 43 tonnes. Arguably the critical future challenge for those tasked with armoured vehicle protection is finding a way to get the equivalent of 43

tonne vehicle's worth of protection on to a vehicle with a combat weight of 31.45 tonnes or less!

Threat Drivers

The threat, both actual and projected, drives the level of protection required. Although it is often the case that what you expect in terms of threat does not



A MASTIFF vehicle with CHOKER Mine Rollers from 5 Armoured Engineer Squadron, Royal Engineers, British Army takes part in an exercise in Jordan. Prior to operational involvement in Iraq and Afghanistan nobody had seen a requirement for MRAP type vehicles.

(Photo: UK Ministry of Defence)



(Photo: UK Ministry of Defence)

A British Army CHALLENGER 2 tank awaits developments on Salisbury Plain. The standard CHALLENGER 2 is considered to be very well protected at a weight of 62.5 tonnes, but the enhanced protection options employed in the Theatre Entry Standard variant push vehicle weight to an estimated 74 tonnes.

turn out to be what you actually get. Covering vehicles with bar armour to defeat an RPG-7 level threat is all very well if that is the only threat you are facing, but if you are suddenly dealing with an ever increasing IED threat then bar armour is not really going to be of that much use. As practically everybody has discovered over the years, the thing with threats is that you can usually guarantee to get more of them than you bargained for!

The best place to start with our look at the threat drivers for protection is right at the start of modern armoured warfare, when on 15 September 1916, the first British Mark 1 tank went into action at the Battle of Flers-Courcelette in France. Some 49 tanks were used at Flers but it was not an auspicious beginning, too much was asked of the vehicles. Given time though the performance of the tanks improved dramatically and it became necessary to create a counter to the tank.

The Ideal Counter of Tanks

The ideal counter to the early tank was a conveniently sited artillery piece. Those not always being available it became necessary to provide the infantry with an anti-tank capability. This led to the German Army issuing the 7.92x57 mm K steel core AP round, to be fired from the standard rifle. By mid-1917 improvements in tank armour reduced the utility of the AP round leading to the development of the M1918 Mauser T-Gewehr in 13x92R mm calibre. This was the first dedicated anti-tank rifle to enter ser-

vice and this class of weapons would be the primary infantry anti-tank system through to 1942.

The primary counter to the tank would become the dedicated anti-tank gun, by the end of the 1930s anti-tanks guns from 25 mm up to 47 mm were in service with the major powers. Indeed many assumed that the satisfactory performance of anti-tank guns in conflicts such as the Spanish Civil War (1936-1939) had rendered the tank less than threatening, something that turned out to be a bit of a miscalculation! In 1940 the heaviest

British and French tanks were impossible to stop for many dedicated anti-tank guns, the only successful means of engaging them was the 88 mm gun that was primarily tasked as an anti-aircraft weapon.

Improved Tank Armour

Tank armour would improve throughout the 1940s to confront kinetic energy (KE) threats, new threats were emerging though, specifically chemical energy (CE) threats such as the Light Anti-Tank



(Photo: UK Ministry of Defence)

British Army WARRIOR IFVs heading home on Salisbury Plain. If these WARRIOR vehicles were headed into high intensity combat their protection would be massively increased with appliqué armour on the hull and bar armour covering the rear of the vehicle. Added protection is always worthwhile, but the weight penalty is a concern.

Weapon (LAW) using a HEAT warhead. The US deployed the 2.36 inch (60 mm) BAZOOKA at the end of 1942, with Germany fielding the disposable PANZERFAUST system in November 1943, followed by the reloadable PANZER-SCHRECK in 1944. Once again the infantry has a credible anti-tank threat. Another important development took place in 1943 when Dr. Max Otto Kramer of the Ruhrstahl company was contracted to develop a wire-guided anti-tank missile with a HEAT warhead that became the RUHRSTAHL X-7. Weapons such as the PANZERFAUST would provide the basis for the development of the modern LAW, while the technology of the RUHRSTAHL X-7 would give birth to the European anti-tank missile industry as its technology was the foundation of the Nord Aviation SS.10 and later SS.11 anti-tank missiles that entered service in the 1950s.

tion systems. This was Explosive Reactive Armour (ERA) as developed by Rafael in Israel and fielded in the early 1980s, followed soon after by a similar system concept from NII Stali in the Soviet Union. ERA would find a ready market as armour operators sought to protect themselves from CE threats, yet as has happened so often in the past, as soon as ERA was fielded work started on defeating it. Anti-tank missiles and LAW systems arrived with tandem charge warheads where the precursor was design to strip away the ERA allowing the primary warhead to address the main armour of the vehicle. The next step was protection designers responding with enhanced ERA to counter the tandem charge threat. Nothing really changes, ever since September 1916 there have been those whose mission is to penetrate armoured vehicles and those whose mission it is to protect

ally be fielded on the M1 ABRAMS tank. The British would have to wait until the CHALLENGER 1 arrived in the 1980s before they had a vehicle protected by composite ceramic armour. Further development saw a more advanced composite armour package deployed with the later CHALLENGER 2. In other countries there were a number of other protection options that were developed that offered Chobham-like benefits but were different in their implementation of technology. All of a sudden it appeared that protection was in the ascendant.

One of the Best Protected Tanks of the World

This ascendancy was as ever fleeting, as can be shown by how CHALLENGER 2 protection developed. The standard CHALLENGER 2 came in at some 62.5



(Photo: UK Ministry of Defence)

A Polish Army LEOPARD 2 tank leads a British Army CHALLENGER 2 tank during Exercise Black Eagle held in October 2014 at the Zargan Training Area in Poland. Poland has just embarked on the LEOPARD 2PL upgrade for its LEOPARD 2A4 tanks, while the British are hoping to upgrade their CHALLENGER 2 fleet. Added protection will be an issue in both upgrades.

Despite developments in anti-tank systems most armoured vehicle operators were not that concerned, feeling that conventional armour arrays were enough and that as automotive elements improved armour thickness could be increased. Then came the October 1973 Arab-Israeli War and the significant losses in tanks caused by the 9M14M MALYUTKA (AT-3 SAGGER) anti-tank missile and the RPG-7. According to some the age of the tank was over, all of which was massive overreaction. The stage was set for the next development in protec-

said vehicles. The struggle between offence and defence will never end. While ERA offered a solution to the threats facing existing vehicles, years of research was about to offer a massive improvement in protection to new generation armoured vehicles. This was the famous Chobham Armour, a composite ceramic armour, the development of which had started in the early 1960s in Britain. The technology of this protection was shared with the US and from the early 1970s they would develop a protection solution that would eventu-

tonnes and was considered by many to be one of the best protected tanks in the world. Even so, the latest operational variant is known as the Theatre Entry Standard (TES) and features Rafael appliqué armour on the hull and turret sides, additional armour on the hull front underside, bar armour at the rear of the hull and an IED jamming system amongst other enhancements. The downside is that weight has ballooned to an estimated 74 tonnes! Active protection systems (APS) were one area that was going to be the next



(Photo: US DoD)

A U.S. Marine Corps M1 ABRAMS tank accompanied by Bulgarian and Romanian T-72 tanks during Exercise Platinum Lion 16-2, held at Novo Selo, Bulgaria in mid-January 2016. The T-72 tanks in service with Bulgaria and Romania are T-72M1 export tanks featuring reduced protection.

big thing at one point, although the enthusiasm seems to have cooled. Israel has installed the Rafael TROPHY system on its MERKAVA Mark IV tanks starting from 2009, with the system successfully used in combat in 2011 and in operations in Gaza in 2014 Trophy was again successful with hard kills against missiles and RPGs. The Republic of Korea Army Rotem K2 BLACK PANTHER tank was due to be equipped with a full spectrum APS system thus far though only a 'soft kill' capability is proven. Meanwhile Turkey is funding the development of the Aselsan AKKOR APS system for the ALTAY tank. Other APS programmes are at an advanced stage in Europe and the US.

Pointers to the Future

There are already pointers to the future in terms of materials that will provide more protection at reduced weight, here possibilities exist in terms of nano-technologies such as nano-steel and nano-composites. Significant weight reductions can be achieved using these technologies, without compromising protection levels. Elsewhere advanced ceramic and composite armour solutions continue to be worked on, including combined ceramic/composite materials. Future requirements also exists for advanced transparent armours, fortunately a great deal of work has already been done here in such areas as seeker domes for mis-

siles, as well as for conventional armour applications such as windows. Transparent crystalline ceramics and nanomaterials all offer interesting possibilities with increased performance compared to current materials and a reduced weight penalty as well. Advanced materials and the research and development efforts driven by the need to find new protection solutions based on operational experience gained in Afghanistan and Iraq, do appear to close to delivering the potential for major developments in protection effectiveness. However, as we have seen, any time there is an advance in protection the search for a means to defeat it moves into high gear. There is no reason to expect that fact to change anytime soon. ■



(Photo: ROK Armed Forces)

Republic of Korea Army (ROKA) K1 tanks during a live firing exercise. ROKA is now taking into service the third generation of indigenous Korean tank in the form of the K2 BLACK PANTHER. The K2 features state-of-the-art protection, including an active protection system, but only a soft kill capability is employed currently.

Future Warriors

Soldier Systems and Other Technologies of the Future

Jan-Phillipp Weisswange

All over the world, “soldier systems” – modern battle management and combat equipment systems – are aimed at integrating the foot soldier into network enabled warfare. And all over the world, the same problems are being encountered.

The roots of today's soldier systems date back to the mid-eighties, with the start of NATO's Soldier Modernisation Programmes (SMP). Some of the ideas which came up then were straight out of the popular sci-fi films of the day. The uniforms were supposed to protect the wearer from ballistic and NBC threats, keep the body temperature constant, and provide chameleon-like camouflage adaptation to changing environments. Helmets with integrated radio, respirators, and head-up displays, were supposed to be able to provide every conceivable piece of information about the soldier's situation, while hand-held weapons the size of small submachine guns were supposed to lay down highly effective fire even from behind cover.

A lot of this turned out to be unfeasible in the field, or unrealistic. The end of the Cold War also saw the resources for R&D dry up.

ception wizards often draw the vehicles of the infantry group into the system as well. These serve as the interface between management at company and platoon level to the next highest command level, as well as carrying supplies, weapons, and munitions, and, not least, serving as energy charging station for the electronics carried by the soldier. The link between unmanned systems and soldier systems is another important area for consideration too.

Germany: From the IdZ Basic System to the Extended System

In 1991 Germany committed to carrying out the national SMP programme. As from 1997, the General of Infantry, the then Federal Agency for Defence Technology and Procurement, and the “System

Soldat” industrial project team, with the EADS Group at its head (nowadays Airbus Defence & Space) brought the basic system of the Infantryman of the Future (IdZ) to series readiness, based on components which were in fact available. Official handover took place in 2004.

In August 2006, under the leadership of Rheinmetall, a start was made, in parallel with the introduction of the basic system, on the system development of the project advancement phase towards the IdZ ES (Extended System). IdZ-ES does not represent an extension of the basic system, but rather an evolutionary new development, and since 2013 it has been in service in Afghanistan. IdZ ES, as a holistic system concept, integrates the “infantry entire system” notion – the ten-man infantry section, or the nine-man mechanised infantry section, with their vehicles and base station – into the networked operational management structure. For the first time, this links the section and the next highest level of command, allowing for the simultaneous exchange of speech and data, and, via a software interface (SUSS), also allows for access to the management information system of the German Army.

Soldier Systems Today

But even this could not stop the systematic technologisation of the infantry. At the present time, more than 40 nations worldwide are working on soldier systems. Modern concepts are almost all characterized by the following component groups: Weaponry, including optics and sensors, clothing, including protection and load carrying equipment, management equipment, consisting of radio, computer unit, and operational equipment, and energy supply. Tactical level management personnel also often carry special hardware. And in most cases this is added to by an extensive array of detection and reconnaissance gear. The con-

Photo: MoD UK



While the British Army is currently introducing the Future Infantry Soldier Technology (FIST), the Defence Science and Technology Laboratory is already working on the Future Soldier Vision.

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Combining the Infantryman of the Future – Extended System (IdZ – ES) with the PUMA Infantry Fighting Vehicle



With the Fantassin à Équipements et Liaisons Intégrées system (FELIN), weapons optics can be used for observing from cover.

Particular attention should be drawn to the core system and the helmet system. The core computer, which is provided with power from a battery pack, both carried on the back (Electronic Back), uses a series of interfaces to control all the items of equipment and sensors which the soldier carries with him. Among the main functions are power supply management, access control and monitoring, soldier information system for map/position display, navigation, communications, exchange of reconnaissance and target data, processing of a variety of sensor data (such as own position, direction of view, etc.), operator interface, and visualisation, as well as system configuration. By way of a manual operating unit (BAG, Operation and Display Unit), the soldier is able to control the soldier management system and communications. On the BAG, or, as an alternative, on the OLED helmet display, he can access all the relevant data about the situation, the position of friendly forces (blue force tracking), about the mission, and about the system status. The modular personal clothing system can be optimally adapted to the environmental and temperature ranges required. Added to this a ballistic protective vest (protection class 1/level IIIA) worn beneath the outer

clothing, with integrated ventilation shirt. The modular load carrying equipment holds munitions, combat gear, Electronic Back, and additional items of equipment. Likewise, the load carrying vest, designed as a rapidly removable plate carrier, can accommodate ballistic protective plates (protection class 4/level IV). The section commander and the second in command also carry additional command and control equipment, with the portable management computer (TFR). Fitted on the weapon are wireless push-to-talk buttons, which allow for radio communications with the weapon ready for action. Optical and optronic add-on units can also be accommodated on the weapon.

The Challenges

But despite all the innovations, today's soldier systems all run up against the same critical factors. First of all, there are often issues with the ergonomics, weight, and performance parameters of military management systems, developed, tested, and procured over lengthy periods of time, in relation to comparable civilian technology. It is often overlooked, however, that far higher demands are imposed on these sys-



Demonstrator of the Norwegian Modular Network Soldier – the operation and display device is worn on the arm.

tems with regard to toughness and safety and security standards. As well as this, the new clothing and equipment which come with the soldier systems are in most cases appreciably more modern than the average equipment which was previously used, and are constantly undergoing further development.

The modular architecture of the systems is intended to allow for later improvements and combat value enhancements. For example, in April 2015 Sagem (Safran) received an order for the introduction of functional improvements, based on operational experience, for the V1.3 version of the French soldier system Fantassin à Équipements et Liaisons Intégrées (infantryman with integrated equipment and communications). FELIN V1.3 will include a new configuration for the improvement of reconnaissance and combat functions of the system. There are also software updates for snipers and mortar teams.

Reservations regarding the complexity of computerized combat equipment weigh much more heavily. Carl von Clausewitz himself already knew that in war only simple solutions win. Doubters foresee the danger of the soldier no longer being able to concentrate on his natural surroundings simply due to the mass of electronics involved. This applies equally to many of today's smartphone addicts, as "digital natives". Availability problems can exacerbate existing acceptance issues still further. A modular combat and management equipment system can be compared with a main weapons system for generic soldier usage. Training is the be-all and end-all, if the combat value of such equipment is to be fully exploited. The soldier must be able to mas-

ter “his system” blind; and whether that is realisable and sustainable with pooled equipment combinations instead of standard single-man equipment seems unlikely.

Further Steps

“It won’t be long before the uniform can walk by itself”, joked one observer, right at the start of the SMP. The first steps in this direction are represented by the US development HULC (Human Universal Load Carrier), or the French Pendant HERCULE. These support the foot soldier

Photo: Jan-P. Weiswange



“Kinetic Operations Suit”, Revision’s system demonstrator for the Tactical Assault Lightweight Operator Suit programme

in carrying heavier loads over longer distances. A similar aim is being pursued by the US DARPA with its Warrior Web programme. In 2013 the U.S. Special Operations Command initiated the concept of the Tactical Assault Lightweight Operator



The Swiss Integrated Modular Operations System Schweizer Soldat (Swiss Soldier) is currently undergoing field tests.



Photo: MoD Singapore

The Advanced Combat Man System of the Singapore Armed Forces

Suit TALOS). The protective suit, with exoskeleton, was intended in particular to provide protection in close-quarter situations, and went down in history known by the comic name borrowed from the movies as the “Iron Man Suit”. The project involved, among others, Revision. Even if TALOS remained nothing more than a system demonstrator, the Canadian company exploited the knowledge it had gained from this for products in the sectors of ballistic protection and energy supply.

Comrade Robot

And there is even talk of doing without soldiers at all. By analogy with the unmanned aerial systems, there are unmanned ground vehicles (UGV), for all kinds of tasks. The German Federal Armed Forces (Bundeswehr), for example, are using a UGV

robot for ordnance and IED clearance (tEO-Dor, PackBot, Route Clearance Package), as well as for reconnaissance (Mobile Sensor System, MOSES).

Between 2003 and 2011, Lockheed Martin developed for the U.S. Army, as part of the Future Combat Systems programme, a whole family of UGV’s. This Multi Mission Unmanned Ground Vehicle (formerly the Multifunction Utility/Logistics and Equipment, MULE) weighed about three tonnes, and comprised an XM1217 transport vehicle, an XM1218 mine clearance unit, and an XM1219 combat robot fitted with a machine gun. In 2011 the Army called the project off, however, since it regarded the need for an aerial close support drone as a priority.

Of course, the end of MULE did not mean the end of all UGV activities. Four unmanned transport vehicles went to Afghanistan as squad mission support sys-

Infantryman of the Future worldwide A selection of current soldier systems				
Country	System Name	System Suppliers	Status	Notes
Australia	Land72/125 (Land 200)	BAE Systems, Elbit selected	Tranche 1: 2014 concluded Tranche 2: 2013 ordered Tranche 3: 2017-2022 planned	Modernisation of personal equipment under way separately
Belgium	Belgian Soldier Transformation (BEST)	Elbit	Elbit Smart Vest selected	Co-operation with Netherlands and Luxemburg
Canada	Integrated Solider Systems Project (ISSP)	Rheinmetall, Saab	Under qualification	Company-internal designation "Argus"
Czech Republic	Voják 21.Století (Soldier of the 21 st Century)	VOP CZ, Sternberk	Under development	
France	Fantassin à Équipements et Liaisons Intégrées (FELIN; Infantryman with Integrated Equipment and Communications)	SAGEM (Safran)	FELIN V1.3 (3rd batch) ordered	Also comprises new clothing, protection, and carrying equipment, up to 40 percent lighter
Germany	Infanterist der Zukunft – Erweitertes System (IdZ – ES; Infantryman of the Future – Extended System)	Rheinmetall, Hexonia, (clothing, protection, and carrying equipment)	In operation	Company-internal designation "Gladius"
India	Future Infantry Soldier as a System (F-INSAS)	No information available	Introduction planned as from 2020	Programme currently divided into two sections
Italy	Soldato Futuro (Soldier of the Future)	Selex Communications, Beretta	Introduced	
Japan	Advanced Combat Infantry Equipment System (ACIES)	Hitachi	Under development	Heavily drawing on COTS components
Luxemburg	Cooperative Modernisation Program of the Army for a Soldier System (COMPASS)	Elbit	Elbit Smart Vest selected	Co-operation with Belgium and Netherlands
Netherlands	Verbeterd Operationeel Soldat Systeem (VOSS – Improved Operational Soldier System)	Elbit	Elbit Smart Vest selected	Co-operation with Belgium and Luxemburg
Norway	Norwegian Modular Network Soldier (NORMANS)	Thales, NFM (clothing)	Being introduced	Two versions: NORMANS Light (navigation/communications), NORMANS Advanced (for command personnel)
Poland	Indywidualny System Walky Tytan (Individual Battle System Titan)	Bumar Group	Start 2006; being introduced	Company designation "Uhlán 21"
Russia	Ratnik (warrior) command system Strelets	Tsniitochmash, Radioavionica Corporation	Series-ready, Ratnik-2 in planning	Introduction of Ratnik-2 should take place in 2025-2030
Singapore	Advanced Combat Man System (ACMS)	ST Kinetics	Development concluded in 2012	ACMS Lite currently under development
South Korea	Future Warrior System (FWS)	No information available	Under development, introduction planned as from 2020	
Spain	Combatiente Futuro (Fighter of the Future)	Airbus	Under development	
Sweden	Markstridsutrustad Soldat (MARKUS)	No information available	Under development	
Switzerland	Integriertes Modulares Einsatzsystem Schweizer Soldat (IMESS; Integrated Modular Operational System Swiss Soldier (IMESS)	Airbus	Series-ready, field tests running	Further developed IdZ basic system
UK	Future Infantry Soldier Technology (FIST)	Thales, Source (Virtus clothing systems)	Being introduced	DSTL has started the "Future Soldier Vision" project
USA	Warrior Web	No information available	Under development	Follow-on project of Land Warrior as part of the Future Force Warrior, which in turn was part of the Future Combat System

Photos: Jan-P. Weisswange



The Russian RATNIK soldier system, which includes the STRELETS command system, can also use GPS as well as the Russian counterpart GLONASS. The equipment for command personnel includes portable command computers, such as the Commanding Officer Manpack Kit, which covers the chain of command of company-platoon-squad-individual soldier.

Photo: MoD Russia



The Russian URAN-9 Unmanned Ground Combat Vehicle carries automatic cannon, coaxial MG, and antitank projectiles.

tems. Among the curiosities of the programmes was the BigDog from Boston Dynamics. This four-legged robot mule can carry loads of up to 150 kilograms even over rough terrain. In live tests with the U.S. Marine Corps, however, it ultimately proved to be too loud. The tracked Battlefield Extraction-Assist Robot from Vecna Robotics is intended to evacuate wounded personnel from hot areas, either autonomously or by remote control.

The Russian armed forces, too, have been working intensively for a few years on the field of robotics. In 2014 they established

their own research department. There are a number of UGVs currently under test, among them the URAN-9 combat platform. Intentions are for special forces within the Strategic Rocket Troops to be using the first robotic platforms for object protection as from 2017. In as little as ten years, robotics are intended to account for some 30 percent of the combat resources of the Russian armed forces.

Visits to the relevant defence trade fairs or the European Robotics show (www.elrob.org) also regularly demonstrate that development is striding ahead.

But every robot needs either direct remote control, or programming by human beings, in order to be able to deploy its full defence and combat capability.

Laser Weapons

Following on from high-tech combat equipment and robots, the last of the sci-fi utensils in today's arsenal are laser weapons. These are high precision, soundless, and have enormous range combined with powerful effect, and can also be scaled with regard to intensity. This makes laser beams ideally suited for appropriate reaction and defence in the face of today's threats. In Europe, MBDA and Rheinmetall are among the companies which are conducting intensive research in this area. Presentations have already featured combat resources or destroyed drones, and even incoming mortar rounds. Such HEL effects, however, are the size of antiaircraft cannon systems, which makes them appreciably bigger than hand-held weapons. In their size class, however, there are compact systems in between, which serve as target markers or for (non-harmful) dazzling, and are therefore classes as non-lethal resources. One example is the GLARE RECOIL device by B.E. Meyers which has been selected by the US Marine Corps for the Ocular Interruption System programme.

The Outlook

New materials, intelligent textiles, advanced techniques for weight reduction, and miniaturization – these are just a few of the buzzwords which will be shaping the further development of future soldier systems. But however innovative such developments may be, experience has shown that, in the final analysis, only a fraction of them end up with the soldiers. Despite all the technologisation, in the end it comes down to solid tools. And these have to be tough. It might be assumed that recruits who are children of the computer age will be able to deal with these devices more readily, in particular when it comes to the digitalization of the battlefield. Essentially, they are used to using smartphones to keep themselves in touch in networks worldwide, to make their own locations known, or to report on activities. But that is way off the mark! When it comes to combat, the soldier must not confuse the real world with the virtual, and create parallel worlds. And here the egoshooter computer game generation fall short, just as much as with their physical fitness and capacity for stress. The leaders in the military will in future remain in demand as guides, as trainers, and as educators – and perhaps even more so than ever. ■

Understanding Individual Needs in Future Soldier Systems

Tim Guest

Some 40 countries are conducting force modernization programmes of various kinds to address everything from armaments, vehicle equipment and communications aimed at meeting the needs of troops on tomorrow's battlefield. Among these are more than 20 future soldier programmes, many in Europe, with manufacturers and government laboratories developing and deploying what they see as the best, new, sensor-laden personal equipment to create the most effective and capable fighting soldier on tomorrow's connected battlefield. The tailor's dummy, however, is not without limits.

From Denmark's DANES, Finland's WARRIOR 2020, France's FELIN, Germany's GLADIUS, the Netherlands' VOSS and the UK's FIST 2/3 future soldier system programmes, to name but a few, Europe is an R&D and operational hotbed for some of the very latest and most advanced programmes of their kind anywhere in the world. Some of the finest soldiers in the world are being equipped with some of the most advanced, integrated personal technologies that soldiers anywhere have ever experienced. In some cases, multiple programmes have been running to address the needs of different units in tri-service/multi-service environments. Some countries' programmes have already ended, some have been postponed indefinitely, while others are in full swing actively pursuing optimum designs, new weaponry, efficient personal power supplies, as well as brand new wearable textiles and sensors.

UK Procurement versus UK Vision

The UK's Future Integrated Soldier Technology (FIST) procurement programme, running since the early 2000s and managed by the Dismounted Close Combat Integrated Project Team at the UK MoD's Procurement Agency, is now in a phase 2/phase 3 stage, including R&D into sensor technologies that need to be integrated into the close combat infantry soldier's gear. In addition, the Dismounted Close Combat Trainer (DCCT) requirement for FIST support to the British Army has been changed and a £13-million modification and upgrade contract has

UK's Future Integrated Soldier Technology (FIST) procurement programme is now in a phase 2/phase 3 stage.

been awarded to Meggitt. This will see devices needed to support FIST enhancements added in simulation, with associated ballistics and round effects for SA80/UGL rifle simulators, modifying them to accommodate new thermal sights. FIST integration will be supported by Meggitt's new FATS M100 system architecture, which is compatible with the wide range of devices and software packages needed to build upon the DCCT's capability.

The 5.56mm SA80 assault rifle is the current standard-issue infantry small arm. Under FIST, the rifle will either be fitted with an enhanced sighting system, or it will link

directly to the soldier's helmet-mounted sight. The latter configuration would allow the firer to 'see' and shoot around corners without moving from a protected position. FIST phase 1 has already been completed and it is expected that some 35,000 sets of FIST kit will eventually be procured and deployed by the British Army, the Royal Air Force Regiment and the Royal Marines during the 2015-2020 timeframe.

Meanwhile, fresh out of the starting blocks at DSEI 2015, the UK MoD unveiled a futuristic uniform design, as part of its future soldier plans, incorporating sensor-laden body armour, a smart watch that monitors life signs and smart glasses with integrated cameras – in what it termed its Future Soldier Vision (FSV).

This is a part of the MoD's plan to ensure British soldiers beyond the year 2020 have high quality equipment, using the latest technologies based on current military research and emerging commercial technology. The first phase of the concept has been developed by the UK's Defence Science and Technology Laboratory (Dstl), with industry partners Kinneir Dufort and SEA (Systems Engineering and Assessment Ltd). According to a Dstl spokesperson talking to ESD, "FSV in particular is about looking at the future and is not a procurement programme. It covers everything including clothing, comms, power, etc, that didn't all appear in FIST".

In a statement at the time of the initial September announcement, Ross Jones, Programme Manager for Close Combat Systems, Dstl, said, "The FSV concept provides the MoD and industry with an aim point for what the soldier could look like a decade from now. It provides a platform to challenge what this future could be and how industry and academia could help the MoD make it a reality."

The FSV is designed to work as an integrated system with survivability, enhanced situational awareness and network capability all central to the concept. Protection technology, a network of sensors for information sharing and power and data connectors will also all be built-in. The design includes a head sub-system with active noise reduction earphones, lightweight



Photo: Meggitt Training Systems



The UK Ministry of Defence has contracted Meggitt Training Systems to upgrade its small arms, forward air controller and indirect fire training systems.

sensors for information sharing and integrated power supply. A torso sub-system of segmented armour that can be customised to the user is part of the concept and features a quick release cord at the shoulders in case of an emergency. Sensors to record biometric data are also part of the FSV thinking together with smart glasses with a heads-up display, integrated camera and bone conducting headphones to increase situational awareness.

Giles Verwey, Principal Consultant at SEA, told ESD that there are very few purely technical challenges remaining in delivering the technologies to support a future soldier vision. Some of the key issues include cost, "since the equipment will be fielded in large numbers unit cost and whole life cost are important issues." He also said that ruggedisation is an issue, and that while "COTS electronics are powerful and robust and have been used to demonstrate a range of technologies, there is a question as to whether they are robust enough for the physical and electronic military environment".

"Power consumption is also an issue," Verwey continued. "Again, for the dismounted soldier power means batteries, which mean additional weight. It is critical that equipment power consumption is addressed, particularly the use of low power standby modes, since equipment may be switched on for long periods but only used occasionally."

"It's also essential to consider how future technologies can be designed so they do not increase the burden on the soldier. Any developments must reduce the overall weight burden. If kit is not easy to use and does not help the soldier, they will not use it. So there is no point in just piling technologies onto the soldier. However, there

are a number of technologies that can offer significant benefits and a number of approaches that can be used to make them user friendly. Consistency in user interface for different functions is important – standardisation in the approach to user interfaces. Another approach is to re-use ap-

Photo: MoD UK



At DSEI 2015, the UK MoD unveiled a futuristic uniform design as part of its future soldier plans – in what it termed its Future Soldier Vision (FSV).

proaches that soldiers are naturally familiar with such as those adopted in smartphones and video games."

SEA's Verwey concluded, "Finally, the issue of presenting the vision in a way that decision makers can grasp is important; a new tank or aircraft is relatively easy to sell the benefits of improved technology. It is harder to present the benefits of an integrated soldier system, as opposed to a number of different pieces of equipment."

A German Gladiator

Germany's GLADIUS system, developed and manufactured by Rheinmetall, is the new variant of the Bundeswehr's IdZ programme. Called IdZ-ES (Future Soldier – Expanded System) by the Bundeswehr, Rheinmetall's GLADIUS was originally ordered for the German forces for use in domestic and overseas operations. First units of the system were delivered in Q1 2013, with some 900 systems now operational; the intention is to kit out further infantry, armoured infantry, air force security and naval special ops units going forward. Integration of the system with the latest armoured vehicle platforms, including BOXER and PUMA AFVs, is also part of the development plan, with Rheinmetall working on various sensors mainly for fire control and mine detection operations. GLADIUS includes: full digital voice, data, video and other communication systems incorporated into the head-gear system, a body-worn computer using a Linux-based operating system, sensors, GPS-based navigation aids, body armour and an innovative carrying system. Using Rheinmetall's Interconnected Command Control Communications Computer Unit (IC4U), GLADIUS also provides a real-time information exchange capability between the soldier, vehicle units and relevant tactical networks – battalion, brigade.

Rheinmetall emphasises the importance of providing troops with 'an open infantry system based on modular combat equipment that delivers enhanced performance and reduced weight'. The latter reference to weight reduction the company recognises as important to 'avoid overburdening the soldier'; but it also highlights the need for equipment to be, in Rheinmetall's words, 'easy to use even under tough field conditions'. These are fundamental principles the company has brought to its design table for the likes of GLADIUS, as well as various systems and component solutions for other NATO partners, including its ARGUS soldier system. A contract for ARGUS was awarded to Rheinmetall last year by the Canadian Forces for their Integrated Soldier System project.

Pushing the Tech – Mounted or Dismounted – Headgear Connectivity

Tomorrows' soldiers, whether mounted or dismounted, will need to stay connected and networked into the command and control elements of the whole battlefield situation at all times. And just as Rhein-

late start', which has given the FDF and its Finnish defence industry partners the opportunity to look carefully at all other programmes already underway. In the case of the programme's integrated THOR Combat Headgear System, manufactured by prime contractor Savox Communications in partnership with Millog (NVGs) and FY Composites (ballistic protection), which is

operate perfectly with every other sensor and headgear sub-system from the outset. But THOR is also designed to connect into the onboard intercom/comms/C3 system via an individual soldier's Personal Communications Unit (PCU) that is easily disconnected when dismounting from an AFV. Such a PCU is positioned on chest or shoulder, tailored into a soldier's equipment. Individual PCUs connect the headgear of each of the crew and mounted troops, into the onboard radios and intercom system via distributed connection points throughout the vehicle, such as an AFV platform like Finland's Patria Armoured Modular Vehicle (AMV), or Germany's BOXER APC. These have two or three-man crews and can carry from eight to ten men, depending on the vehicle.

THOR also uses a single power source to run its tech, thereby removing the risk of power loss at critical moments. This eliminates the need for spare batteries. This single-source power supply enabled a new lightweight NVG to be designed for the system, which very importantly, removes the need for a counterweight at the back of the headgear. This removes the physical stress and neck pain so often experienced in 'over-equipped, heavy, counter-balanced' headgear.

In other European programmes different facets of sensor integration, communications and data provision are being explored



Photo: Rheinmetall

Germany's GLADIUS system, developed and manufactured by Rheinmetall, is the new variant of the Bundeswehr's IdZ programme.

metall's IC4U provides a real-time information exchange capability in the case of GLADIUS-equipped soldiers, real-time feedback from any individual soldiers on the ground will be crucial to provide command and control centres with a new source of timely information on which to base important tactical decisions on tomorrow's connected battlefield. Headgear systems that integrate critical technology such as communications, night vision and electro-optical devices, situational awareness tech at the head, can make an effective C3/C4I centre out of each individual. In fact, simple ballistic helmets will no longer be relevant, because if mounted inside an APC, an effective headgear system will need to connect a soldier into the vehicle C3/intercom architecture. It will need to provide full connectivity into the onboard network with instant access to communications, both inside and outside the vehicle into the wider tactical radio network.

One of the European future soldier programmes taking this approach is the Finnish Defence Force's (FDF) WARRIOR 2020 programme, which has progressed apace since its relatively late start. Aimed at meeting the needs of all arms of the FDF, WARRIOR 2020 is said to be one of the most advanced programmes of its kind due to its 'relatively



Photo: Savox

THOR Combat Headgear System, manufactured by prime contractor Savox Communications in partnership with Millog (NVGs) and FY Composites (ballistic protection), is integrated in the Finnish Defence Force's (FDF) WARRIOR 2020 system.

now in mass production for the FDF, integration of all its elements has been a crucial design rule from the start. Each item, be it communications, hearing protection, night vision, ballistic protection, has been designed specifically to integrate and inter-

operate perfectly with every other sensor and headgear sub-system from the outset. But THOR is also designed to connect into the onboard intercom/comms/C3 system via an individual soldier's Personal Communications Unit (PCU) that is easily disconnected when dismounting from an AFV. Such a PCU is positioned on chest or shoulder, tailored into a soldier's equipment. Individual PCUs connect the headgear of each of the crew and mounted troops, into the onboard radios and intercom system via distributed connection points throughout the vehicle, such as an AFV platform like Finland's Patria Armoured Modular Vehicle (AMV), or Germany's BOXER APC. These have two or three-man crews and can carry from eight to ten men, depending on the vehicle.

Soldier programme (DANES) ballistic eye protection is being looked at as a separate item for inclusion in an overall 'above-the-shoulder' solution. In the Netherlands, the Improved Operational Soldier System, or VOSS, programme is continuing trials for such elements as a smart vest, an efficient power supply (E-Lighter), load carriage and protective systems. ESD understands the added need for an 'integrated head-gear system' has, however, recently been removed from the Dutch programme requirements due to budget cuts.

Individual Needs

New technology is one thing but some would say that the fighting soldier has already been pushed to his or her physical and mental limits over the years. How new soldier tech systems will impact their biological core – the human form – has no doubt been considered by all R&D. But there remain many well-respected professionals sceptical that, in their haste to come

experience to life when he explained to the distinguished audience, that in terms of the sophisticated sensors and tech they were proffering for use by combatants, where the jungle was concerned they needed to think again. "The jungle is neutral," Heaword said. "It attacks anything and everything. When it comes to most of the future soldier tech equipment and sensor ideas I've seen and heard here I must be blunt: manufacturers and other stakeholders need a reality check."

Heaword runs tropical trials for the Defence University and the defence industry in Malaysia at the Kongkoi Jungle School. "In the jungle it's dangerous to sleep on the floor not simply in case of the occasional spider or snake but in case of flash floods, when everything gets washed your way. No matter how sophisticated your headgear, for example, if it obstructs any part of your vision in the jungle it's bad news. You need every bit of your peripheral vision in this environment."

And as European troops find themselves operating in all sorts of regional conflicts around the globe, their latest kit, be it GLADIUS, DANES, FELIN, or FIST in one form or other, will need to be fit for any scenario. In recent years British troops have found themselves in Sierra Leone and even German troops are now operating in Africa and the Middle East; an additional 550 soldiers were recently approved by Angela Merkel's cabinet for deployment against jihadists in Mali and Iraq.

Future soldier systems will, therefore need to be versatile and no matter how amazing a new headgear system, small arms sensor upgrade, or individual integrated power system might seem in the lab, when soldiers find themselves out of their geographic comfort zones, equipment needs to be fit for purpose. If not, it will degrade performance and be discarded quicker than you can say "Brahms or Liszt?" and at great expense, simply to ensure individual survival.

Cautionary Words

"From a dismounted point of view," Heaword cautioned, "future soldier developments are frightening. Someone else is trying to micro-manage them in the most difficult of scenarios, whilst they themselves are trying to stay alive and contain a situation. The ethos of taking the thinking out of the thought process will take the

dismount away from his basic soldiering skills – the very skills that have kept European and NATO troops alive through some difficult campaigns."

His cautionary words continued. "In basic training everything was repetitive and resulted in muscle memory, that is it became second nature." He said that this type of training gave the European soldier a certain quality and skill set that is missing in many other militaries and that while most young men who join the military are more physically than academically inclined, they do, however, tend to have a 'unique streak of honour and duty'. "Command and control may seek up-to-date instant streaming to make a bigger judgement call, but the dismount does not need to be in the loop; and making that judgement call will also not be as fast as the events changing on the ground".

He went on to add that with insurgents notoriously difficult to track as they hide in plain sight and stay away from certain 'media formats', this point needs to be looked at. "Why do we need to use the same media formats that they evade? Our intelligence services are extremely good at tracking and intercepting dark threats and they are the ones that need future proofing, with the dismount having better and lighter protection. They need a system that they actually move, fight and function in, and perhaps a clearer comms capability that is immune to the ECM. They'll also want better fire power that is lighter and easier to manage. Superior transport and air support are also key for the future dismount."

Asked if integration of all systems in a future soldier system is important right at the start of the design phase, rather than taking an 'add-this, add-that, after-the-fact' approach, Heaword stressed that add-ons have been 'a little disastrous' as they do not balance on the limited real-estate that the dismount has when he goes in to combat. "The weight soon starts to mount. So developing a system from the ground up that has the ability to be modular is critical. It has to be modular as the dismount's needs in urban combat are different to those in the jungle and the arctic. Modularity is the one thing industry and military procurement are struggling with. If you can scale it then you can make it modular but you have to think outside the normal industrial approach."

With so many European future soldier programmes Heaword had a final word to add: "Europe has a quality of soldier that is unique. Germany, Norway the Dutch, for example, all have good, well-trained and well-disciplined troops who are very capable, but to me (and I am



As part of the "Verbeterd Operationeel Soldaat Systeem" (VOSS) the Dutch MoD together with Belgium and Luxemburg procures the Smart Vest manufactured by Elbit.

up with the latest battle-winning soldier-borne systems, manufacturers and military alike have made some things too complex. Are they risking too much on commercial off-the-shelf tech (COTS)? And have they overlooked some of the harsh realities of the hostile battlefield environments in which soldiers will be expected to operate? ESD turned to Steve Heaword, Technical Director at Crib Gogh and tropical capability advisor to the PPG at the Dstl, for his views. During his time in the military Heaword specialised in jungle warfare with deployments in South America and South East Asia. At a recent soldier technology event in London, he brought some of that

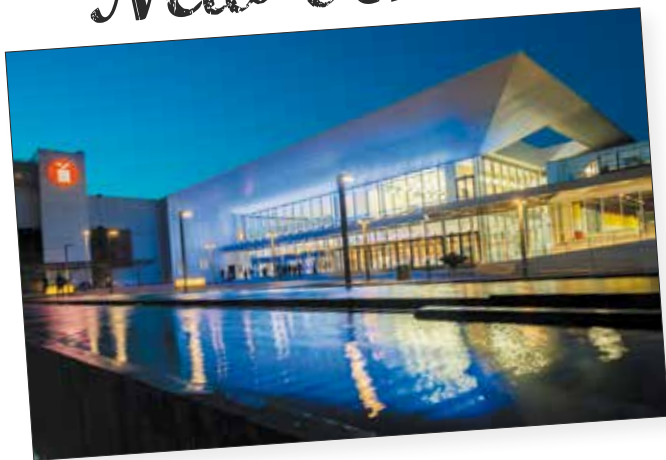
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slightly biased here!) there is a level of professionalism that British troops have that I have not seen elsewhere. That said, many NATO allies do integrate and cooperate on certain programmes and developments, but each of the NATO members still wants to retain that certain individuality and have their own idiosyncrasies that others do not have, and rightly so... You cannot give everybody the same strengths and thought processes."

Another Voice of Concern

Certain that such views are not solitary, ESD spoke with Moin Rahman, Founder/Principal Scientist at HVHF Sciences, LLC in Florida. On the human boundaries and whether the defence industry should be made more aware of latest, scientifically-proven human constraints over which new soldier systems and tech should not step, he began with a quote from the Joint Chiefs of Staff [Concept for Joint Operations. Washington: DOD, May 1997: "The purpose of technology is to equip the man. We must not fall prey to the mistaken notion technology can reduce warfare to simply manning the equipment."

Rahman continued, "Yes, a soldier, who first and foremost is a human being, has capabilities and limitations not only in terms of his physical and cognitive functions, but also specialization. As an example, one can't expect an expert robotic operator involved in Explosive Ordnance Disposal to be an expert marksman, or COM-L (Communication Leader) who can set up and troubleshoot a tactical radio network in the field. Traditional military doctrine in terms of function allocation and specialization of a soldier's specific role would have to continue as new technologies -- assuming their usability and utility have been validated -- stream into the battlefield.

He told ESD that turning a warfighter into an operator of multiple technologies may not serve well. "Unless the technologies are smart, wherein they offload the demands placed on the soldier dynamically in real time, without imposing any cognitive or physical burden. The only exception to this might be personal protective equipment (PPE's) that is worn on the body and is ergonomically well fitted."

Rahman added that, "The full power of technology, particularly pertaining to C4ISR, can play a vital role at the back-end of the system, where the commanders develop high fidelity battlespace awareness to determine the right strategy given a specific goal to disable the adversary. The tactical level, where, say, a dismounted warrior operates in the field is, however, best served by technology that enables him to make the right decisions rapidly without being overwhelmed with information or user-interfaces that have no value to him. The cardinal rule, first and foremost, is don't get into the way of the soldier's natural and organic sensors: eyes, ears, nose and vestibular system."

When it comes to the battlefield where Human-MACHINE Interactions (HMI), Human-System Interaction and Integration (HSII) and Human-Human Interactions (HHI) all have a role and potentially impact both tactical and strategic outcomes, Rahman and his organisation are experts. He concluded, "In counterinsurgency (COIN) operations, strategic Human-Human Interactions (HHI) take precedence over HMIs (for example C2, naval or aerial platforms), or HSI (for example air-to-ground coordination; or inter-agency collaboration). Thus, every scenario has its own specific requirements and needs a certain paradigm (HHI, HMI or HSI), or a combination thereof, to be optimized to maximize successful outcomes and minimize catastrophic errors such as blue-on-blue fire, or the loss of civilian/non-combatants' lives."

Less than Lethal Weapons

Jan-Phillipp Weisswange

Non-lethal and less-lethal weapons enable the actors in police or military police-like operations to control more flexibly situational escalation and de-escalation. Their deployment, however, is governed by the principle of protecting both user and “recipient”.

Cracking down on violent troublemakers always requires the operating forces to strike a compromise between effectiveness, protection and distance. Non-lethal weapons (NLW) and less-lethal weapons (LLW) close the gap between withdrawal

German Federal Police – issue telescopic batons to their officers on patrol. The short extendable baton (in German: Einsatzstock, kurz, ausziehbar – EKA) may be conveniently clipped on the uniform belt during daily patrol duty or, depending on the mis-

sion, rather discreetly concealed under plain clothes. Once drawn, the EKA extends to full length by a swift sling motion – and such determined projection of readiness for action alone may help to deescalate a situation. Renowned manufacturers of such operational equipment are ASP and Bonowi. Also the Swiss police and security equipment supplier B&T has recently presented a variant of its “Triton Advanced Tactical Baton” that complies with the requirements of the German Police Technical Guideline. The “tonfa” has meanwhile become the prevailing service equipment worldwide not only for officers on patrol but particularly in Crowd and Riot Control (CRC) operations – for some years now also in Germany where the Special CRC Team of the Bavarian state police played a pioneering role. This Asian martial arts weapon features a side-handle projecting from the baton at a 90-degree-angle. Given appropriate training, a tonfa – in Germany officially jargonized as “multi-purpose operation baton” or “multi-purpose rescue baton” (“Mehrzweck-Einsatzstock” or “Rettungsmehrzweckstock”) – enables the application of varied striking, pressure, blocking and joint lock techniques and is also suited for parrying missiles. Many renowned manufacturers like e.g. Bonowi, Cop or Monadnock supply tonfas to police and security authorities all over the world.

Irritant Spray Devices

Just for the reason of self-protection it may often be advisable to keep distance to the



The multi-purpose rescue baton (“tonfa”) parrying (simulated) missiles

and use of firearms. Put simply, the spectrum ranges from a box on the ear to water cannon shots.

Batons

The baton is still the standard means of using force and inflicting physical violence. Yet for some years already, more modern operational equipment has replaced the century-long tried and tested wooden billy clubs or the classical rubber truncheons. Some police authorities – among them the



The telescopic Triton Advanced Police Baton of B&T in operational and transport positions

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The TW1000/RWG10/2 irritant projector in jet mode

opponent. To this end, irritant spray devices have turned out to be operationally very effective. They are available in relatively handy versions for patrol duty like e.g. the Hoernecke/TW1000 RSG-6 that may be attached to the uniform belt with a steel spring clip. To deal with major operational scenarios irritant projectors like the TW-1000 RSG 8 may be deployed which come already at the size of a small fire extinguisher, fitting e.g. into the thigh holster of a riot gear. The effective range of such irritant spray devices is about seven metres while smaller versions cover up to five metres. The "Robber Hotzenplotz", made internationally popular by the German children's writer Otfried Preußler, is known to have carried a pepper pistol. Today, however, the members of his trade should beware of products like the different launchers of PepperBall or even handy devices like the JetProtector JPX of Piexon. This handy double-barrelled pistol incapacitates the target by delivering a liquid OC agent stream with a speed of up to 120 metres per second. Back-pack irritant spraying devices offered e.g. by Hoernecke or NST represent another variant. The liquid jet stream of the TW1000 RSG-10/2 is effective at ranges of up to 14 metres. The irritant may also be dispensed in the form of spray clouds.

The TASER Stand-Off Electroshock Weapon

Referring as well to a literary personage is "Thomas A. Swift's Electric Rifle" – in short: TASER – that was patented in the early 1970s and has been gaining traction also in the European police services since the beginning of this millennium. Taser International now belongs to the market leaders in the field of stand-off electroshock weapons. A taser fires two barbed dipoles out of a cartridge which deliver via insulated wires a strong electric current pulse paralysing sensory and motor nerves to the effect that the target is instantly incapacitated. Similar products are supplied by Condor of Brazil ("Spark")

or the US company PhaZZer Electronics. Pitched by Taser International as "smart life-saving technology", the most recent variants of its stand-off electroshock weapons do not only control the amount of deliverable charge but also document their deployments. In addition, Taser International supplies body-worn cameras ("bodycams") as well as special evidence management software enabling easy device fleet monitoring, the evaluation of recorded taser deployments and digital evidence management. Taser International had meanwhile offered also a 12-gauge shotgun shell called "XRAP" which covered ranges of some 60 metres.

FN303 and FN303P

FN Herstal offers its FN303 and FN303P LLW systems as an alternative. The FN303 technology includes diverse projectiles, a buttstock-equipped and a pistol-like model as well as diverse accessories. The FN303 systems use compressed air and CO2 cartridges, respectively, for delivering projectiles. The long gun covers ranges of up to 50 metres and the FN303P handgun up to 20 metres. Effective muni-

tions include impact projectiles, paint mark projectiles containing washable or permanent paint, stun projectiles with synthetic pepper (Pava) and a powder-filled impact projectile. The long gun is equipped with an 18-round magazine while the magazine capacity of the handgun is seven rounds. Das FN303 is also suitable for countering small rotary wing drones – a scenario which has increasingly taken on greater significance in recent years.

Grenades and Rubber Bullets

Clamours for rubber bullets are regularly coming up in Germany – usually after May Day riots – and then usually shrugged off as cracker barrel blather. Yet rubber bullets are common operational equipment e.g. in Switzerland – the more so because the Swiss Confedera-



Taser X2 stand-off-weapon, Axon camera and transmitting unit on the charging station.

tion's police force elements provided for Crowd and Riot Control operations are relatively small. As recently as last October, the cantonal parliament in Zurich quashed with substantial majority two

Agents Contained in Irritant Spray Devices

Oleoresin Capsicum (OC)

OC is a natural extract from peppers. OC according to formulas e.g. for the TW1000 is non-toxic, does not cause any known adverse effects and is used in food-grade quality for defence products. OC irritates mucous membranes and eyes and causes coughing and possibly nausea.

Pelargonic acid vanillyl amide (Pava)

The synthetically produced Pava copies one of the three main pungent ingredients of the natural pepper extract capsaicin. Pavawas originally developed as an inexpensive substitute for natural capsaicin in pharmaceutical blood circulation stimulating applications such as anti-rheumatism plasters. Its effect is similar to pepper spray.

O-chlorobenzylidenemalononitrile (CS)

The CS agent has been in use as 2nd generation irritant since the 1950s. It has largely substituted the previously common chloroacetophenone (CN) lachrymator. Ever since, the police use CS with tactical delivery systems. In Germany, CN and CS irritants are officially approved for use in over-the-counter defence sprays.

(Photo: Jan-P. Weisswange)



With the FN303, operating forces can reliably bear effect on targets at up to 50 metres.

(Photo: IPH Hitzkirch)



The rubber bullet shooter backs up a (simulated) police measure.

motions that would have banned rubber bullets and restricted the use of tasers by cantonal police officers.

NLW/LLW grenades provide another option to affect violent crowds effectively at a distance. Several manufacturers present a broad ammunition portfolio including e.g. stun grenades (flash/bang), smoke and irritant cartridges, rubber bullets or kinetic impact munitions. The latter are optionally supplied with paint mark kits with which the shooter specifically engages particularly violent rioters – e.g. throwers of improvised incendiary weapons – to mark them for subsequent detainment.

Water Cannons

Water cannons are also a means to use direct force. Their water tank contents may serve most diverse purposes. Among

With a Knife to a Shooting – a Question of Proportionality

More often than not criticism is levelled at police officers shooting at assaulters armed with a knife. Here it must be clearly stated: A knifeman definitely constitutes a life-threatening situation – especially at close range. The probability of surviving a knife attack stands at 60 per cent, while 80 per cent of gunshot victims survive. Critique of the use of firearms against knife attacks attests to absolute ignorance and is utterly misguided!

the latest-state-of-the-art vehicles is the WaWe10000 water cannon used by the German anti-riot police forces. The Austrian special vehicle manufacturer Rosenbauer implemented this impressive vehicle on a Mercedes-Benz Actros chassis. The WaWe10000 has a crew of five men: commander, driver, observer, and two monitor operators. Its tank holds 10.000 litres of water deliverable with variable spray force and stream shape via two front and one rear monitor. Its effective range is about 65 metres. Moreover, CN and CS agents may be added to the water and dispensed as aerosols.

Conclusion

Both non-lethal and less-lethal weapons provide great flexibility in dealing with many different situations. Yet their application requires extensive training for only who knows their effects can deploy them proportionately. ■



(Photo: Bundeswehr)

Back-pack water cannon operated by the Bundeswehr

Viewpoint from New Delhi



Jay Menon

Sand, Sea and Shells

India Aims to “Do a LIMA” by Shifting its Flagship Arms Show to Goa

India seems to believe in the adage “change brings opportunity”. The decision by the federal government to shift “DefExpo”, the country’s biggest land, naval and homeland security systems exhibition, from the hustle and bustle of the national capital New Delhi to the sun and sand state of Goa proves just that.

“With Goa being a global tourism hub with its enchanting settings, organising the ninth edition of the biennial defence exhibition there is likely to attract more participants, à la Langkawi International Maritime and Aerospace Exhibition (LIMA) in Malaysia,” an official at the Indian Ministry of Defence says, exuding confidence.

Goa also happens to be the home state of the country’s Defence Minister, Manohar Parrikar, leading to questions as to whether political considerations played a role behind the decision to shift the venue to Naqueri-Quepem in South Goa. So far, the only official reason given by the organisers is that the Indian Trade Promotion Organisation (ITPO) in the national capital has expressed its inability to spare the eight-time venue, Pragati Maidan, which is under renovation – and has been for many years, contributing to profound doubts over the organizational ability of the hosts.

However, arms manufacturers around the world have already expressed their keen interest in DefExpo 2016, and are planning to put together displays aimed at

catching the eyes of acquisition managers of the Ministry of Defence, especially since the country’s defence industry is at a critical point in its expansion cycle, driven by the military’s modernisation plans.

“More than 450 top companies from over 55 nations have confirmed their participation and these numbers are expected to rise, making it the biggest edition of the DefExpo series,” said the MOD. The show will boast live demonstrations of armoured vehicles and military systems, alongside operations by unmanned aerial vehicles (UAVs). “Unlike the past, when the focus was on defence equipment, homeland security and naval war equipment will be major features at this year’s exhibition at the seaside venue,” an official said.



Homeland security is regarded as an integral part of defence and security business by Original Equipment Manufacturers of global systems, and a critical area for a nation dealing with internal as well as external threats.

The global defence industry increasingly reflects the steady convergence between nations' defence and homeland security requirements. In India, homeland security concerns have come to the forefront especially in light of the terror attack in Mumbai in 2008 and other real and perceived threats. Homeland security is projected to be one of the key areas of focus, for government, both central and state, with research indicating that by 2017 India's total expenditure on Homeland security might reach approximately US\$20 billion.

For global defence vendors, DefExpo 2016 is an important opportunity for entering the Indian market, assessed at about US\$100 billion value between now and 2022.

Over the past few years the exhibition has maintained a path of sustained growth and is now considered one of Asia's biggest land and maritime shows. While defence expositions all over the world have fora for interaction between buyers and sellers from all countries, DefExpo features primarily one buyer: India. The majority of exhibitors focus solely on selling arms to India.

This edition of the exhibition has a whole new meaning with Prime Minister Narendra Modi's 'Make in India' pitch making the defence sector an attractive investment proposition.

"The exposition will be showcasing India's capabilities in Land, Naval and Security Systems as well as its emergence as an attractive destination for investment in defence sector by providing a platform for forging alliances and joint ventures in the defence industry. The event also provides an excellent opportunity to the Indian Defence Public Sector Undertakings (DPSUs), private sector and other defence-related industries to demonstrate their capability to design, develop and deliver a wide range of military and civil products/services," stated the defence ministry.

Currently, foreign vendors supply an estimated 70 per cent of India's weaponry. New Delhi has repeatedly declared, without setting any timeframe, that it should source 70 per cent of its defence needs indigenously. Global majors, therefore, are establishing partnerships with Indian defence producers to become a part of the Indian defence business. The government recently relaxed foreign direct investment (FDI) norms in the defence sec-

tor by allowing FDI of up to 49 per cent and more with Foreign Investment Promotion Board (FIPB) approval.

Tie-ups with Indian companies are also driven by foreign vendors' offset liabilities, which would accrue from defence sales to India.

The proposed Defence Procurement Procedure (DPP) has diluted the offset norms. Now the offset obligations will be applicable only in deals worth over 20 billion rupees (US\$300 million), instead of the present benchmark of over 3 billion rupees. That means companies which win deals over 20 billion rupees will have to return at least 30 per cent of the contract value back to India as offsets. Smaller deals will be exempt from the offsets obligation.

In all cases, however, the foreign vendor must identify an Indian partner through which it would discharge its obligations.



DefExpo, which will be held from March 28- March 31 – that is, right across one of the most important Christian celebrations of the year, Easter – provides defence companies with a platform to meet prospective offset partners as India strives to take the path of achieving self-reliance in the design, development and production of equipment, weapon systems, platforms required for defence as soon as possible.

In the last few years, India has surpassed China as the world's largest importer of weapons systems, fuelled mainly by strong annual GDP growth rates averaging around 8 per cent a year, while keeping defence spending between 2.5 per cent to 3 per cent of India's GDP. As a result, India's defence budget has grown from 585.9 billion rupees (US\$8.7 billion) in 2000-2001 to 2.47 trillion rupees (US\$40 billion) in 2015-2016.

Promoting European Armaments Cooperation

A Joint European Platform for Education and Training

Florian Seiller, Wolfgang Sagmeister and Alois Preineder

The 4th European Armament Cooperation (EAC) Course, organised jointly by the European Security and Defence College (ESDC), the European Defence Agency (EDA) and the Austrian Ministry of Defence (MOD) and Sports, took place in Brussels (27 to 29 October 2015) and Warsaw (23 to 27 November 2015).

The aim of the course: Enhancing mutual understanding of armament cooperation.

Strengthening its defence capabilities for a more credible Common Security and Defence Policy (CSDP) is one of the great challenges of the European Union (EU). Although the EU has launched a number of initiatives in recent years, such as the Ghent-Initiative (2010) and the Capability Development Plan (CDP, 2014), EU Member States still face significant military capability shortfalls. National capability development cycles have not been harmonised yet. There is no permanent and structured coordination of national defence planning. Quite often, cooperation efforts are hampered by divergent requirements, procurement timescales, financial constraints, industrial considerations and protectionist tendencies, inefficient management structures and procedures, but also by a lack of political will. Besides, international armament programmes quite often lack efficiency. It is true that a number of important multinational armament projects have been initiated, developed and procured. However, cooperative projects have frequently not produced the economic, military and political benefits so often invoked:

Photo: EDA



The European Armament Cooperation Awareness Level Course 2015 in Brussels.

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a more efficient use of available resources, increased harmonisation of requirements and standardisation, greater military effectiveness through interoperability, a cross-border-consolidation of defence industries, and a strengthening of alliances and relationships among European countries. Studies have shown that many multinational armaments projects have also been hampered by a lack of mutual understanding among different stakeholders. While soldiers from all over Europe and the NATO countries might learn the same commands, a common “language” for cooperative armament programmes is still missing. Some countries run these kinds of training courses whereas others offer little or no formal preparation for international tasks. If the Europeans want to push arma-

ments cooperation forward, they need to develop a common understanding of basic principles, institutions, possibilities and best practices. This requires a harmonised education and training (E&T) framework. To sum up, the potential of European armaments cooperation remains largely untapped. This is especially alarming in the face of new security challenges.

Increased Necessity to Cooperate

Current developments make the advancement of military capabilities even more important. Europe faces a wide range of threats at its southern and eastern peripheries, like the Russian intervention in the Ukraine and Crimea, as well as the rise of



Photo: Jagoda Gawliczek/NDU Warsaw

The European Armament Cooperation Expert Level Course 2015 in Warsaw.

international terrorism and the increasing instability in the Near and Middle East. The ongoing budgetary restrictions across Europe make this task an even more challenging one. Taking this into account, cooperation is no longer an option, it is a necessity.

Aims and Course Programme

The EAC Course, co-organised by the ESDC, the EDA, the Austrian MOD and a host nation, is the first EU-wide jointly developed training platform in the field of armaments. The course was developed in order to enhance mutual understanding in armaments issues and to establish a network to promote and foster armament cooperation. The course primarily aims at personnel who need to gain knowledge and information on international armament cooperation and/or who are earmarked for potential future leadership positions in the wider defence area. Massimo Guasoni, Head of Unit Education; Training & Exercise (EDA), explains: "We believe that the practitioners who work in national and international armament cooperation can highly profit from the course. We are able to provide them with practical knowledge and understanding of the armament sector along with its frameworks, the stakeholders' tools and processes as well as challenges and benefits available at the EU level".

The education consists of two courses: A three-day Awareness Level Course (AWL) at the EDA in Brussels and a five-day Expert Level Course (EXPL) in a host nation, last year in Warsaw, at the National Defence Academy. The courses are preceded by a mandatory Internet-based Distant Learning (IDL) module of the ESDC. The AWL Course focuses on the political and

economical environment, institutions and stakeholders and intercultural communication. It deals with the missions, policies, and programmes of the EDA, the Organisation of Joint Armaments Cooperation (OCCAR) and NATO, but also with those of regional defence cooperation platforms, such as the Nordic Defence Cooperation (NORDEFCO) and the Visegrad Group. Furthermore, it gives an overview of the benefits and challenges of cooperation in the armaments sector. The EXP Level Course deals with management of cooperative programmes, legal aspects, best practices and core soft skills. It also includes practical group exercises. Intercultural awareness is considered in both courses as a fundamental requirement for European armaments personnel. The Decision Level is already covered by existing courses and seminars, e.g. by the French "Session Européenne pour les Responsables d'Armement" (SERA) and the German "European Seminar for Top Armaments Manager Personnel" (EuroSTAMP).

A Brief History of the EAC Course

The question of education and training has been on the EDA's agenda since 2006. The need was officially recognised in the European Armaments Cooperation Strategy (2009) and further developed during several EDA workshops. Under the Czech Republic's EU-Presidency (2009) the initiative received a new impetus. Supported by several European countries and under the auspices of the Republic of Austria, the pilot course started in Brussels and Stadtschlaining in 2012. In the following year, the course took its current form. With 46 students from 13 EDA Member States

and Serbia, the European Commission, the European External Action Service (EEAS) and OCCAR, last year's course attracted the highest number of participants and was once again a great success. The EXP Course was hosted by the Polish MOD and the National Defence University (NDU).

Possible Way Ahead

A lot has already been achieved in order to strengthen armament cooperation and the training of armament cooperation managers in Europe. The increasing complexity of defence systems and armament projects demand a more structured and effective collaboration between partners. Sometimes existing national training concepts do not take into account the quick changing international environment and/or specific cooperation requirements (e.g. EU regulations and guidelines, etc.). Because of these increasing challenges, a different approach towards Armament Cooperation Education & Training is suggested. Based on the individual academic education of the Armament Cooperation managers, (e.g. economics, technical, etc.) training on specific national planning & acquisition procedures, budget cycles, accounting tools and techniques should be provided by the nations. The national course content should be modelled around practical armament projects, Lessons Identified and Lessons Learned from other partners.

The ESDC EAC AWL and EXPL Courses aim to complement the national training in order to provide knowledge covering the multinational aspects for people foreseen to take part in international teams or already working in such teams. Other multinational course activities should be complementary to the ESDC EAC Courses. In order to give EAC Managers the right tools to cope with the above mentioned complex cooperation environment and to harmonise existing national education concepts, a specific system of training modules should be developed. This new "European" training concept should be according to the Bologna model and aim at the final level of a master degree. This future "European Master on Armament and Acquisition Cooperation" (eMAAC) education concept should be modular and based on distant learning, iReaders, tutorials, global class room, summer school and residential modules. Ideally, a "European career path" for EAC Managers would have to be developed and individually agreed with employees. This could generate a "new generation" of highly qualified and commonly trained "European Armament Cooperation Managers". ■

“We cannot compromise on safety or on the quality of testing.”

Photo: Airbus DS



Interview with Fernando Alonso Fernández, Airbus Defence & Space, Executive Vice President Military Aircraft

ESD: You have been the Head of Military Aircraft since 1 March 2015. What are the core competences of Military Aircraft and which of these are to be fostered to keep up with the global market?

Alonso: Above all we are an engineering company making aircraft. And therefore we are making organisational changes now – and I hope cultural changes in the longer term – to further empower the engineering function internally. At the same time we are in the services and support business, which we have had great success in growing in recent years, but where there are still excellent opportunities to increase our market position and improve our efficiency. And our other key competence, as is the case across Airbus Group, is innovation. The A400M and tanker programmes sucked in a huge amount of our I&D resources for a long time – with some great results, but we are not stopping there and now have some very promising projects underway looking well out into the future, and we probably need to devote more resource to nurturing those and bringing them to reality.

ESD: Military Aircraft covers a broad portfolio of aircraft. Are there any synergies among the different programmes, for example common engineering and development efforts?

Alonso: Yes, very definitely, and a key element of what we are doing internally is to reorganise our engineering around centres of competence rather than around programmes or locations. We need to ensure

that whichever programme we develop, we have access to the best expertise that we have in the company. That’s a simple thing to say, much harder to achieve of course, but it’s fundamental to what we’re trying to achieve and I am personally involved in driving this.

ESD: With the development and production of the A330 MRTT Airbus was successful in opening a door into a new arena. Are there any modifications and upgrades to this aircraft in progress to keep up pace with other contenders?

Alonso: The great thing about the A330 MRTT is that it automatically benefits from the normal Airbus continuous product enhancement process applied to the basic A330. So soon we will see a new standard of aircraft as the basis for the tanker with updated computers, and structural and performance improvements. These are incremental changes that ensure that the A330 – which has been a superb aircraft – remains competitive. And separately we are working on a range of developments of military-specific enhancements, notably on mission planning and debriefing in the near-term, but also in more exotic areas like automated AAR in the longer term.

ESD: How many C295 and CN235 are planned for deliveries per year, and what is your order backlog for these types?

Alonso: We generally keep production of the light and medium aircraft at around 18-20 per year and the backlog is now 33,

which is also fairly consistent. The C295 is selling extremely well, and if we can maintain that kind of stability then I will be happy.

ESD: Beside the loss of an aircraft there are many reasons for the delays in the A400M multi-role military airlifter programme, one of them being the delays in the development programme. Are there any means under your control to accelerate the flight test schedule and to add urgently needed functionalities and capabilities to the aircraft?

Alonso: Flight test in itself is not really the issue – believe me when I say we are working pretty well flat-out in that area and we cannot compromise on safety or on the quality of testing. We are making good progress and getting very close to introducing the new capabilities that I am acutely aware everyone wants. It can be a little like decorating your house – you do a huge amount of work and you seem to have nothing to show for it, and then at the end of the process it all comes together. But we have certified various airdropping and paratrooping capabilities last year, DASS work is moving forward positively and we hope to get those results in coming few months, and other functionalities like the night vision FLIR have already been done.

ESD: The air refuelling capability of the A400M extends from fast jets through to helicopters. What is the present status of the respective test programmes?



Photo: U. Rapreger

Shown here in front is the A400M MSN04 prototype which is also used for air refuelling tests. In the background is MSN28 prior to its delivery to Turkey.

Alonso: We have already cleared the aircraft to refuel fighters – which we demonstrated with F-18s – and then it's a question of formally qualifying all the receivers that the different air forces require. As we've previously said, we know that we can't refuel helicopters with the existing equipment. We have now agreed with the customer that we will commission an appropriate independent consultant to perform a feasibility study on whether it can be done with certain modifications, and whether it would be worth the expense. We should have a good idea of where we stand by the end of 2016.

ESD: At which point were responsibilities for all industrial-related activities assigned to the Operations organisation and how does your business area take advantage of this decision?

Alonso: The move of the A400M IFA and FAL production to the Airbus Defence and Space Operations organisation under my colleague Pilar Albiac-Murillo was part of the same process that led to my appointment in 2015 and I very much welcomed it. It meant that we could take expertise from one part of Airbus Defence and Space and apply it to a problem somewhere else – in fact that's exactly the kind of thing that I want to be able to do inside the division every day. There is some absolutely world-class

production expertise in Pilar's team and it has been critical in turning things around after a very difficult period.

ESD: What efforts are currently being undertaken to increase the production rate of the A400M?

Alonso: I think we have largely stabilised current production and I'm pleased that we ended 2015 inside the range of deliveries that we committed to back before the summer and which is a substantial improvement on the year before. Now we are gradually gearing up for a higher rate which will eventually take us to a stable rate of 21-23 per year. We are doing that not through any one big change but through a vast exercise in analysing how we were previously doing each process and then a relentless drive to do it better, coupled with a rigorous focus on quality. We are using lean techniques and related practises in all of this, and I would point out that on the tanker conversion line and the light & medium FAL we have had immense success with lean – so I firmly believe that we have big potential to make gains in the A400M FAL.

ESD: Which of the production aircraft is planned for delivery with the Standard Operating Clearance (SOC) 1.5?

Alonso: The question of the SOC is a contractual matter between us and OCCAR. But in general terms we wanted to introduce certain enhancements in these last four aircraft in 2015, and then more this year. A great deal of our conversation with OCCAR and the nations concerns the issue of balancing the desire for the new capabilities with the requirement to get more

aircraft into service as soon as possible. The air forces have differing priorities so it's not always a simple issue to manage.

ESD: During development, we saw a lot of engine problems and failures. Have these problems been solved and are the engines operating as specified, across the full flight envelope including "hot & high"?

Alonso: First let me say that, considering the truly remarkable leap in propulsion technology that it represents, the TP400 engine has been a big success. I understand why you ask the question, but the engine is complex and its failure modes are rather unforgiving – so everyone hears about them. In reality now the engine is performing well, we and our customers are learning more about it every day through in-service experience, and bit by bit it is reaching the kind of maturity that all of us want to see.

ESD: About 14 A400Ms are presently in operational service. In terms of percentage, do you have information about the availability?

Alonso: It is not that easy to generate meaningful data at present because we are still talking about very small fleets – even France has only seven aircraft. But we can see that availability is steadily improving and mission completion rates are in excess of 90%. As you'd expect at this stage, we still need to do better, but we are well on our way and you can see our customers having the confidence to deploy the aircraft all over the world, which is a very encouraging sign. ■

The questions were asked by Ulrich Rapreger.

An Onerous Task

The “Make-in-India” Initiative in the Defence Sector

Jay Menon

India is re-inventing the basket of military diplomacy as the country aims to transform itself from the world’s largest arms importer into a defence manufacturing hub.

With a heightened focus on “indigenisation” and “Make-in-India”, a national programme that encourages foreign companies to manufacture their products in India, the new right-wing government is building institutional capabilities to attract international demand for defence industrial cooperation with India. Military diplomacy could enable cooperation in drawing up equipment specifications, research and development, technology transfers, acquisitions and production.

Thus far, India’s defence diplomacy has been focused on training, joint exercises, repairs and maintenance support, ship visits and student exchanges. However, Prime Minister Narendra Modi wants to enhance and widen defence cooperation with friendly nations. Towards this, the government has established a high-powered panel to propose focus areas and policy changes that will help align India’s significant global clout with its thrust for self-reliance. “Efforts are on to identify means by which defence diplomacy can be a force multiplier for the ‘Make-in-India’,” says Amitabh Kant, Secretary of Department of Industrial Policy and Promotion (DIPP) and one of the main architects of the programme. India is chalking out strategies to explore how high-end technology can be obtained by leveraging its purchasing power as well as bilateral relations with weapon producing nations. Currently, high-end technologies



India’s Prime Minister Narendra Modi and the President of Russian Federation, Vladimir Putin, at BRICS Summit in Fortaleza, Brazil, on 16. July 2014

are not being shared with India through the routine process of procurement mainly due to commercial interests.

“Defence is a monopsony; it works on government orders. While we have made several changes to make things extremely easy, one of the biggest changes is that we have taken 60 per cent of items away from defence licensing. We expect a lot of orders to flow in the coming years... That has just begun and in the years to come, defence will be one of the key sectors to drive India’s economy and the “Make-in-India” initiative,” says Kant.

India has the third largest Army, the fourth largest Air force and the seventh largest Navy in the world. India is among the top 10 countries in the world in terms of military expenditure and world’s largest arms importer. India allocates about 1.8 per cent of its Gross Domestic Product (GDP) towards defence spending, of which 40 per cent is allocated to capital acquisitions. But only about 30 per cent of India’s equipment is manufactured in India, mainly by public sector undertakings (PSUs). Even when defence products are manufactured domestically, there is a large import component. All these factors make the Indian defence market one of the most attractive globally and provide an immense opportunity for both domestic and foreign players in the defence sector.

The Indian defence sector is certainly raising global expectations, with several global vendors and foreign leaders vying with

each other to get the first-mover advantage in supporting the ambitious “Make-in-India” programme.

From Russia with Love

Russia became the first country to make its move under the “Make-in-India” umbrella. In a fillip to Prime Minister Modi’s ambitious initiative, Russia’s Rostec decided to form a joint venture with India’s state-owned Hindustan Aeronautics Ltd. (HAL) to manufacture Kamov 226T military helicopters in the south Asian nation.

“The Inter-Governmental Agreement on the manufacture of Kamov-226 helicopters in India is the first project for a major defence platform under the Make-in-India mission. It is, rightly, with our most important defence partner,” the Prime Minister said in Moscow last December during his joint address with Russia’s President Vladimir Putin.

As agreed, Rostec will arrange the production of as many as 200 Ka-226Ts and their modifications in India. The project is estimated to cost around 60 billion rupees (around 815 million euros).

The Ka-226T has a distinct design as it has coaxial rotors – a pair of rotors mounted one above the other. It is a versatile platform capable of operating in environments ranging from dense urban conditions to mountains.

“Rostec’s competitive advantage lies in the fact that we are ready to deal with not

Author

Jay Menon is a senior journalist based in New Delhi, India, covering civil aviation and defence aerospace for various Indian and international publications, including the Times of India, Hindustan Times, and India’s premier news agency The Press Trust of India (PTI).



Photo: Russia Beyond the Headlines

The Russian state corporation Rostec will arrange the production of as many as 200 Ka-226Ts and their modifications in India.

only the localisation of helicopters in India, we also offer our partners the localisation of production technology," says Sergei Chemezov, Chief Executive Officer (CEO) of Rostec State Corporation. The joint venture with HAL covers maintenance, operation and repair of the helicopters.

"The agreement is the result of lengthy work with our Indian partners. This is the first Russian and Indian high-tech project to be implemented by the Modi government within the "Make-in-India" programme," Chemezov adds.

Though the initial order is "only" for 200 helicopters, it is likely to be increased: India had originally planned to import 197 light helicopters to replace its ageing fleet of CHEETAH and CHETAK, which are used to move troops and equipment to high-altitude locations like Siachen. But the Modi government scrapped the US\$1 billion proposal in August 2014 and decided to manufacture the helicopters in-country through a joint venture with an international firm. India and Russia also took note of achievements in the field of joint design, development and production of high-technology military equipment. Both sides reaffirmed their intention to expand the scope of such cooperation and to leverage the opportunities provided by "Make-in-India" in the defence sector, and directed the responsible agencies to finalise such projects between relevant entities and enterprises of the two countries as early as possible.

Russia's top aircraft manufacturer, Sukhoi, is also exploring the possibility of investing in an Indian joint venture for the maintenance and spares production of its SU-30 combat aircraft in what could make India a hub for regional fighter fleets operating in the region.

French Connection

Within Europe, India's strategic partnership with France is the most comprehensive. If the special relationship between India and France was symbolised by the extension of the Republic Day invitation to France for a

record fifth time and the participation of a French contingent – the first by a foreign military – in the parade, the substance of that relationship has been reaffirmed by President François Hollande's visit, his second in less than three years.

During President Hollande's visit in January 2016 the two countries inked agreements



Photo: Press Information Bureau

Prime Minister Narendra Modi and the President of France, François Hollande, in New Delhi on 25 January 2016.

amounting to an estimated US\$15 billion of business – including US\$9 billion worth of 36 RAFALE fighter aircraft made by Dassault Aviation to replace India's ageing MiGs.

The implementation of the announcement made during Prime Minister Modi's visit to Paris last April about the decision to purchase 36 Rafale combat aircraft in a flyaway condition, was taken forward by signing a memorandum of understanding (MoU) which froze the technical parameters, weapon payloads and lifetime servicing and spares needed. It is expected that the negotiations of the financial terms will be concluded in coming months.

Both countries are also understood to have firmed up an understanding on the offsets segment under which the French have

agreed to invest 50 per cent of the deal's worth in related sectors.

Even as the deal was being reached, French aircraft manufacturer Dassault had already reached out to Indian companies in the defence and security industry for possible Make-in-India partnerships. Estimated at US\$4.5 billion, or about 300 billion rupees, this is expected to make it one of India's biggest-ever offsets deals.

The India government's offset policy requires foreign military aircraft and defence equipment manufacturers to source 30 per cent of the components locally in the case of contracts worth 3 billion rupees or more. A new policy has, however, increased the offset threshold for defence deals to 20 billion rupees. The enhanced limit will apply to defence deals once the policy is notified. India's Mahindra Defence and France's Airbus also inked a pact to make military helicopters in India.

Taking forward a deal signed in July last year, Mahindra Defence and Airbus Helicopters have already started working on steps to produce helicopter parts locally.

"We have made significant progress in setting up the joint venture and together the companies are creating a world-class advanced helicopter production facility in India," a spokesman of Mahindra and Mahindra says.

If this materialises it would be a boost to the Make-in-India, just like the Alstom deal, where the French firm has won contracts worth a combined \$5.6 billion to supply India's railways with 800 new electric locomotives.

"Through this partnership, we target building several of our globally-leading helicop-

ter models in India. This will lead to the transfer of state-of-the-art technologies, development of manufacturing activities and creation of highly-skilled jobs in India," says Guillaume Faury, CEO of Airbus Helicopters.

However, there are a few shortcomings in the bilateral defence diplomacy with France, as former Indian foreign secretary Kanwal Sibal points out.

"Our political leadership understands the value of this relationship with Paris, but the system as a whole lacks the same strategic outlook to the point it should have. Whether the French side has always found the right balance between commercial considerations and strategic goals, needs analysis," he says.

Technology transfer as a strategic lubricant has been insufficient. The contract for 126 RAFALE aircraft has been reduced to 36. The ambitious air defence SR-SAM joint development and production project has been largely abandoned after completion of negotiations.

The contract for Airbus 330 Refuelling aircraft has got bogged down.

"Despite decades of satisfactory service provided by French-origin helicopters like CHEETAH and CHETAK, the French have been denied the contract for light utility helicopters twice, and now it has been assigned to Russia.

"Now, with the Modi government's emphasis on Make-in-India in defence manufacturing, the emerging new opportunities require fresh strategies by French companies," says Sibal.

Several other European countries have also extended their support to the Make-in-India programme. German Chancellor Angela Merkel who visited India in 2015 agreed that it is important for the two countries to explore ways to deepen bilateral co-operation in diverse sectors, such as defence and security. India and Germany signed a deal to fast-track business approvals, to make it easier for German companies to operate in India and to fast-track the "Make-in-India" programme.

Germany has previously supplied military technology to India and several German defence firms have established units or partnerships in India.

EADS, now Airbus, which is a major partner in the development and manufacture of the Eurofighter, has a research and development centre in Bengaluru in southern India.

Atlas Elektronik, which is involved with naval warfare systems, Krauss-Maffei Wegmann, which manufactures the LEOPARD II battle tank, and Diehl Defence, which

manufactures missile systems, also have branches in the country.

Though ThyssenKrupp Marine Systems (TKMS), which builds the Type 214 conventional submarine, does not have a production facility in India, it has worked with local manufacturers and shipyards.

Other Make-in-India Projects in Progress

U.S.-based aviation major Boeing and India's Tata Advanced Systems announced a joint venture that will manufacture aerostructures for AH-64 APACHE attack choppers, recently ordered by India, and collaborate on integrated systems development opportunities in India.

The joint venture will initially create a manufacturing centre of excellence to produce aerostructures for the AH-64 APACHE helicopter, and compete for additional manu-

facturing company SiRA Group in a bid to boost its reach in Europe and enhance its proximity to its key customers. SiRA Group operates across five sites and offers expertise in the areas of precision machining, assembly, and testing of engine, landing gear and aircraft actuation components, as well as welding and fabrication of aircraft assemblies. Key customers of SiRA Group include Dassault Aviation SA, Safran SA and United Technologies Corp. Aerospace Systems.

"The acquisition of SiRA brings highly complementary capabilities to our global aerospace ecosystem along with opportunities to expand our relationship with our key customers in Europe", says Aequs Aerospace president Walt Sirmans. "Expanding our value chain and local and global reach in France, combined with our facilities in Texas and India, provides for significant value creation and strategic customer ac-



Su30 MK-I and MiG 27 aircraft along with two RAFALE aircraft carrying out manoeuvres during exercise Garuda-V on 6 June 2014.

facturing work packages across Boeing platforms, both commercial and defence.

"Boeing and Tata Advanced Systems intend to grow the JV partnership in the future with a focus on opportunities to collaborate on development and selling of integrated systems," an India-based Boeing spokesperson said.

Boeing last year finalised an order for 22 AH-64E APACHE attack helicopters and 15 CH-47F CHINOOK heavy-lift helicopters for India.

Similarly, Dutch firm Fokker Technologies, a division of GKN Aerospace, and India-based aerospace component manufacturer Aequs Pvt. Ltd last year signed an agreement to supply machined components for the CHINOOK heavy lift helicopter that India is also buying. Aequs was selected after a careful process of qualification, proving the ability and affordability through trial production, according to BOEING. Aequs very recently acquired European manu-

facturing company SiRA Group in a bid to boost its reach in Europe and enhance its proximity to its key customers. SiRA Group operates across five sites and offers expertise in the areas of precision machining, assembly, and testing of engine, landing gear and aircraft actuation components, as well as welding and fabrication of aircraft assemblies. Key customers of SiRA Group include Dassault Aviation SA, Safran SA and United Technologies Corp. Aerospace Systems.

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Possibilities for Private Players

India may buy at least \$100 billion worth of defence equipment over the next 15 years, according to estimates by the Confederation of Indian Industry. Domestic development of defence technologies is still a work in progress.

Arms development is undertaken by the Defence Research and Development Organisation almost single-handedly, which is under the direct control of the Ministry of Defence. But, as Prime Minister Modi

Indian Navy Shows the Way

Of the three services, the Indian Navy has unveiled a 15-year plan to achieve full indigenisation in all phases of warship construction, from ship-building to systems to weapons, and aligned it to the Make-in-India programme.

In a significant boost for the Indian Navy, the indigenously-developed nuclear-powered ballistic missile submarine INS Arihant is undergoing sea trials.

'Kalvari', the first of the SCORPÈNE class submarines built by Mazagon Dock, was launched last October and will undergo extensive sea trials before commissioning into the Navy later this year.

However, some analysts remain sceptical about the attempts to localise defence manufacturing. "We see limited scope in this aspect. Across platforms, indigenisation has more or less trailed intended goals, with imports inevitably making up for shortfalls," says brokerage house ICICI Securities Ltd in a January 21 note.

"While DPP (Defence Procurement Procedures) 2013 created excitement along with Make in India projects, it may take significant time to blossom. Over the next five years, we see limited prospects of meaningful indigenisation barring radars and missiles," says the report. ■



Photo: DefExpo

Private companies such as the Tata group are looking for more opportunities in manufacturing defence equipment initiated by joint ventures with international defence firms.

says, "We are reforming our defence procurement policies and procedures. There would be a clear preference for equipment manufactured in India... We are expanding the role of the private sector, even for major platforms."

Needless to say, Make-in-India has opened a huge array of possibilities for private partnership in defence which can bolster the manufacturing sector. Foreign Direct Investment may not have come in as expected yet the ray of hope lies in many Indian companies steering towards indigenous production of defence items.

Private companies such as Bharat Forge

Ltd, Reliance Industries Ltd, the Tata group, Larsen and Toubro and the Godrej group are looking for more opportunities in manufacturing defence equipment. Anil Ambani's Reliance Group and the Adani Group's Adani Defence Systems and Technologies Ltd are the latest entrants in the race to look for joint ventures with international defence firms.

Mahindra already makes military vehicles, select artillery systems and land-based weaponry. And last July, Mahindra Group's unit Mahindra Defence Naval Systems Ltd tied up with UK's Ultra Electronics to build equipment for underwater warfare.

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Interview with Paulo Amorim, Chief Executive Officer of Condor (Brazil)

ESD: Mr. Amorim, CONDOR Non Lethal Technologies has been a leading manufacturer of non-lethal technologies for more than 30 years. How does Condor define the purpose of these items?

Amorim: We see non-lethal technologies as means of rendering a person temporarily incapacitated, without causing any lasting harm. In other words, non-lethal technologies not only protect the life of the user and the peace officer, but also the life of the protagonist opposing the police (aggressor or suspect).

ESD: How has the overall situation for this market developed in the past few years?

Amorim: Our company history is closely linked to the history of Brazil itself. In the year we were founded, 1985, 21 years of

development and introduction of non-lethal technologies to every Member State of the UN. This naturally gave rise to important incentives, and also brought about a rise in acceptance of the concept of Non Lethal Technologies worldwide. Since then, the significance of non-lethal technologies has been rising, and this trend is continuing.

ESD: How is your company positioned nationally and on international markets?

Amorim: Our company is based in Rio de Janeiro. We have 560 employees, of whom 25 are engaged in research and development. We are proud to be a “UN-approved

close-quarters effect, to tear gas and irritant agent projectiles, to irritation agent, longer-distance, and impact munitions in a variety of calibres, for longer ranges and for different types of launchers. Added to these are electric shock devices such as our “Spark”, which features a particularly high degree of user safety and security.

ESD: Are there different client preferences?

Amorim: Our clients’ wishes are naturally dictated by the particular level of threat in their country, and the scope of engagement of the security forces. Common trends are, for example, the demand for proportional use of force in different scenarios.

ESD: What other trends do you see developing?

Amorim: I have already indicated that non-lethal weapons can safeguard both the life of the user as well as of the opponent.



Condor offers a wide range of products.



Photos: Condor

SPARK, an electric shock device from Condor, features a particularly high degree of user safety and security.

military regime came to an end. The democratisation which started with the free elections naturally also brought about a paradigm change with regard to the tactics and equipping of police forces. Non-lethal technologies were high on the list, because they saved lives when the police had to take action against disruptive elements prepared to use violence, including the lives of the demonstrators. Against this background of our history, we actually regard non-lethal technologies as being closely associated with the processes of democratisation. Another major step was the United Nations Basic Principles on the Use of Force and Firearms by Law Enforcement Officials from the year 1990. These principles proposed the

Supplier of Non-Lethal Weapons”. Naturally, the Brazilian armed forces and security services are among our clients, as are many others countries around the world. But for more than 15 years we have also been exporting worldwide. We have exported to over 50 countries on all continents who are users of our products. In Europe, for example, these include Belgium, Denmark, France, Greece, and Sweden. We also see clear additional growth potential.

ESD: What about your present product range?

Amorim: We cover the entire product range in the sector of non-lethal weapons. This ranges from irritant spray devices for

But it is not technology alone which wins through, even in the sector of non-lethal weapons. Despite all the safety of use, these are complex systems, and whole of their effectiveness can only be exploited to the full extent with the appropriate training, both technical and also tactical. The past few years have therefore also seen a rise in demand for instruction and training. We are accordingly moving into the role not only of supplier but also of training of Non Lethal technologies. An encouraging factor in this is that many of our clients regard this as an investment in democratisation. ■

The interview was conducted by Peter Bossdorf and Jan-Phillipp Weisswange at MILIPOL in November 2015

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European Lightweight Vehicle

(gwh/df) Italy, the Netherlands, Portugal, Spain and Germany as the lead nation have initiated a new project under the auspices of the European Defence Agency (EDA) the aim of which is to investigate opportunities and challenges of lightweight constructions for Armoured Multi-Purpose Vehicles (L-AMPV). Governmental experts from participating Member States and ten industrial and research entities involved in the project execution (coordinator KMW, Airborne, Camattini Meccanica, CEIA, IABG, IVECO, Scania Netherlands, Tecnalia, TNO and UROVESA) convened for a kick-off meeting held at the EDA. The L-AMPV project aims at delivering detailed information (material, weight, size and price) of vehicle components/parts currently used; determining the items which contribute most weight and recommending how to reduce the weight of these parts taking into account the need for solutions to last throughout the life-cycle. The overall objective of this Research and Technology (R&T) project is to investigate opportunities and challenges of lightweight constructions for Armoured Multi-Purpose Vehicles, including new construction techniques.

JFD Expands in UK

(df) JFD announced the expansion in UK with the opening of new offices in Bristol and Glasgow. This is a direct result of the growing businesses, for example was JFD recently awarded a €16.1 million con-



(Photo: JFD)

tract by the UK Ministry of Defence for the provision of the NATO Submarine Rescue System (NSRS), encompassing all aspects of operation and through-life support. The announcement of the NSRS contract came also shortly after the company was award-

ed a contract by the Commonwealth of Australia for the long-term provision of the Royal Australian Navy's submarine escape and rescue capability for five years, with further options through to 2024.

Standardisation of Eurofighter Certification Processes

(df) Eurofighter Jagdflugzeug GmbH and NETMA, the NATO Eurofighter and Tor-



(Photo: NETMA)

nado Management Agency, have signed an agreement to streamline the Type and Airworthiness Certification process and reduce the workload on nations and their Military Aviation Authorities on January 28, 2016. "Participating Member States have agreed to introduce EMAR21 into national regulations and under that rule to share a common certification process that also includes a delegation capability to other partner nations and industry," NETMA's General Manager Graham Farnell explained. "What this initiative does, is to take a sensible look at where common standards can be mutually agreed, and then put in place the most efficient approval process possible to secure and maintain those standards." Eurofighter's CEO Volker Paltzo added: "The idea for adopting EMAR21 into the Eurofighter programme came from the Ministerial Task Force for Eurofighter-Typhoon. It makes great sense on many levels. Qualification and Certification activity, by its very nature, takes time. Sharing and delegating a common standard of approval will bring new efficiencies into the programme." Prior to the signature of the agreement, the Eurofighter programme required a four-nation agreement on Type and Airworthiness Certification for any changes to the weapon system, limitations to, or modification of, the Type Design – in a stepwise approach. In the future, under a phased programme based on using EMAR21 in national regulations, agreed areas of work will be carried out and certified by industry based on the privileges granted by the nations. Further updates may possibly be introduced at a later stage which will allow the same principles to be applied to repair work.

FLIR Acquires DVTEL

(wb) FLIR Systems announced that it has acquired DVTEL, a developer of software and hardware technologies for advanced video surveillance specialized in enterprise-class security and surveillance solutions. The company develops and distributes integrated video management system (VMS) software, advanced video analytics software, visible and thermal security cameras, and related servers and encoders. The combination enables FLIR, with its existing FLIR-branded thermal and visible cameras as well as its Lorex-branded security systems, to be a full-spectrum end-to-end security system provider, serving the consumer, small and medium business, enterprise, and infrastructure-level markets.

Funding of Possible British Submarine Successor

(df) The British Ministry of Defence (MoD) has awarded BAE Systems €259 million to further the design of a successor to the Royal Navy's VANGUARD class submarines. The funding will allow the business to mature the design of the new class of submarines, which will carry the UK's independent nuclear deterrent, including the layout of equipment and systems, and to develop manufacturing processes, the company stated. This last announcement follows



(Photo: BAE Systems)

three previous funding packages awarded to BAE Systems – two awards of €423 million and €406 million to commence initial design in 2012, followed by €331 million in 2015 for the detailed design. BAE Systems is the industrial lead on the programme with more than 1,600 employees working on it. Tony Johns, the Managing Director of BAE Systems Submarines, said: "We are incredibly proud of the role we play in designing and building our nation's submarines. The Successor programme is one of the most challenging engineering projects in the world today and this additional funding will enable us to further mature the design."

IAI Forms Joint Venture with Lingyun Group

(df) Israel Aerospace Industries (IAI) has formed a joint venture with Lingyun (Yichang) Science and Technology Group to establish its first local Chinese maintenance, repair and overhaul (MRO) enterprise in the Hubei Province. This joint venture will be dedicated to expanding civil maintenance services and cargo conversion, as well as laying the groundwork for additional business. This Joint Venture between the two companies has received strong support from the Chinese People's Association for Friendship with Foreign Countries (CPAFFC), as well as from local municipal and provincial governments. The joint venture is named Bedek Lingyun (Yichang) Aircraft Maintenance Engineer-



(Photo: PSM)

sion. In this consolidation process Hudson has also been appointed to the Executive Board of Rheinmetall Defence where he will represent the new Vehicle Systems division. The resulting unit is poised to be a comprehensive supplier of tracked

and wheeled military vehicles and turret solutions, capable of meeting the complete ground mobility needs of the world's armed forces – all from a single source. Under the new structure, Rheinmetall Defence will consist of the following three divisions: Vehicle Systems, Electronic Solutions and Weapons and Ammunition. Annual sales of this new unit are expected to reach €1.4 billion in fiscal 2016. The portfolio ranges from main battle tanks and wheeled armoured vehicles to trucks, like the Puma infantry fighting vehicle, the Kodiak armoured engineering vehicle, the 8x8 Boxer, the 6x6 Fuchs/Fox, the 4x4 AMPV, as well as the new division's TG,



(Photo: IAI)

ing Co. and with the planned investment of €253 million it could have a capacity of 120 aircrafts each year and the annual output value of aircraft maintenance, manufacture and refit could reach up to €210 million. IAI is Israel's largest aerospace and defence company specialized in developing and manufacturing advanced, state-of-the-art systems for air, space, sea, land, cyber and homeland security with systems, like the Heron UAV, being in use with armed forces throughout the world. Sun Jian, the Board Chairman of Lingyun, said: "The establishment of the JV demonstrates the concepts of complementary advantages and win-win cooperation. We will cherish this opportunity to cooperate, and will make full use of resources from both sides, to make our JV business prosperous."

RLS and RMMV Unite to Form a New Division

(df) Rheinmetall AG has decided to consolidate its Defence unit's extensive military vehicle activities in a new division called "Vehicle Systems". As a first step, Rheinmetall Landsysteme GmbH (RLS) and Rheinmetall MAN Military Vehicles GmbH (RMMV) have been placed under joint management effective from January 1 2016. Ben Hudson (CEO) and Michael Wittlinger (CFO) will lead the new divi-

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HX and SX truck families, just to name a few famous examples. Rounding out the portfolio is Rheinmetall's unsurpassed expertise in turret systems, exemplified by products like the Lance turret and the turret structure for the UK's new Scout reconnaissance vehicle. The two management companies – RLS and RMMV – will pull closer together organizationally in the new division and present a common front, while still maintaining their own corporate seats and locations. The ownership structure of RMMV, in which MAN Truck & Bus AG holds a 49% stake, remains unchanged.

Major General Yoav Har Even New CEO of Rafael

(df) Major General (ret.) Yoav Har Even entered his position as CEO of Rafael Advanced Defense Systems Ltd on January 17th 2016. Har Even (49) served in the Israel Defense Forces (IDF) for 31 years in various positions, including as commander of a



(Photo: Rafael)

reserve division, Ground Forces Chief of Staff, and in his last position as Head of the IDF's Operations Branch. He holds a B.A. in Economics and Political Science and an M.A. (with distinction) from the University of Tel Aviv. He is replacing VADM (ret.) Yedidia Yaari, who served as Rafael's CEO for more than ten years. Har Even thanked the Chairman and the Board for their trust, and said he felt proud and privileged to join a company like Rafael – a major pillar in Israel's security and economy and a true force multiplier.

Woodburn New COO of BAE Systems

(df) BAE Systems announces the appointment of Charles Woodburn in the newly-created role of Chief Operating Officer. Woodburn will report to Ian King, Chief Executive as an Executive Committee member and will be appointed to the BAE Systems plc Board as an executive director during the second quarter of 2016. Woodburn already held a num-



(Photo: BAE Systems)

ber of senior management positions in the Far East, Australia, France and the United States during a 15-year career at Schlumberger. For the last five years, he has been CEO of Expro, an oilfield services business owned by a consortium including Goldman Sachs and Arle Capital Partners.

Paltzo New CEO of Eurofighter Jagdflugzeug

(df) Volker Paltzo started as the new Chief Executive Officer (CEO) of Eurofighter Jagdflugzeug GmbH on January 1, 2016. Paltzo's last position was CEO of Atlas Elektronik GmbH in Bremen. He succeeded Alberto Gutierrez, who has been the Eurofighter CEO since June 2013. As part of Eurofighter's rotation policy, Gutierrez became the new head of the Eurofighter Programme at Airbus Defence and Space in Manching on January 1, 2016.



(Photo: Eurofighter)

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