96 / AUG-02-18

European Security & Defence SPOTLIGHT

Published by MITTLER REPORT

New Approaches For European Combat Aircraft

Ulrich Renn

At this year's Farnborough Air Show the United Kingdom announced, one year after France and Germany, its intention to follow an independent path to the development of a sixth (?) generation combat aircraft.

Currently, both projects show only rough outlines. This applies to the nascent industrial teams as well as to the characteristics of the weapons systems they want to develop. In some respects, the British project has already assumed a more solid form. It has a name, "Tempest", and due to an already completed concept study there are even full-scale models. The Franco-German project uses the term "Future Combat Air System" (FCAS) which tends to mean different things in different contexts and its graphic representation had originally been developed the "Next Generation Weapon System". Regardless of what the final products will be called or look like, their development will be determined by similar requirements.

Both designs are stealthy. However, due to progress in radar technology, Electronic Warfare (EW), which has been neglected over the past two decades, will be used to complement stealth. Signature Management (SM) will be used to further enhance survivability. Based on comprehensive reconnaissance, improved on-board sensors and enhanced planning tools (on- and off-board) SM will allow aircrews to adapt mission profiles (altitude, speed, tactics, emissions) to the "live" threat and minimize the likelihood of detection and engagement.

Both teams see future combat aircraft as parts of a system of systems (another use for the term "FCAS"). The FCAS concept is based on the idea that, even if individual platforms will, to a certain extent, need to retain the ability to operate autonomously, only a network of platforms can deliver

(Photo: Ulrich Renn)

the level of performance required to fulfil the entire spectrum of future operational tasks. Future platforms should, therefore, be able to interact and, above all, exchange information with as many types of systems as possible (including older technical generations).

Sensors available on all platforms within a network should be able to cover the entire electromagnetic spectrum in high resolution. The large amounts of data they generate must be fused in (near) real-time to enable comprehensive situational awareness which enables superior quality and speed in tactical decision making by aircrews. In addition to the development of more powerful sensors and algorithms for data fusion, this requires new approaches to the question of how an abundance of information covering a large volume of (air) space around an aircraft can presented effectively to its crew. If the aim is to display complex information in a way that is truly intuitive, new technologies for displays are required – perhaps using artificial intelligence and virtual reality. Tempest, for one, is planned to have a "virtual cockpit".

The high agility required of combat aircraft causes them to have relatively small airframes. Conventional designs compensate for this by carrying the bulk of their armament and a significant part of their fuel as external loads. However, external loads and stealth are generally difficult to reconcile. For this reason, new stealth-designs aim to accommodate more weapons and fuel within the airframe or – as the next best solution – to develop conformal fuel tanks and containers for weapons that will not increase an aircraft's radar cross-section significantly. Both solutions will, however, increase weight and size of an airframe. Together with the high demand for electrical energy and cooling caused by the large number of sensors, emitters and other electronic components on modern combat

aircraft, this requires a new, more powerful generation of engines.

Maintaining current standards for thrust-to-weight ratios while; at the same time, ensuring sufficient supply of electrical energy and achieving good mission performance (range and endurance) preferably without air refueling, calls for a higher engine performance (thrust and power generation) with approximately the same or even lower engine weight and specific fuel consumption. This kind of performance is expected of Adaptive Cycle Engines (ACE) engines which combine the properties of a high-thrust Turbojet with a fuel-efficient Turbofan. New materials and manufacturing techniques also offer the opportunity to further increase the operating temperature and thus the efficiency of jet engines.

The role of forming a bridge between existing and future European combat aircraft is supposed to fall to the Eurofighter – for the Franco-German as well as for the British project. At Farnborough, Volker Paltzo, CEO of Eurofighter GmbH, said that today, Eurofighter is the benchmark for European armaments cooperation and in the future, it will be a mainstay of any European FCAS working together with existing and future European weapons systems for several decades to come. Therefore, it offers the best platform to carry a whole range of technologies for future combat aircraft from design and testing to certification, transforming them into mature European capabilities.

So far, the Franco-German team includes Dassault and Airbus, the British team BAE Systems, Rolls Royce and the British daughters of MBDA and Leonardo. Both teams emphasize that they are open to other participants. According to a presentation by the Federal Association of the German Aerospace Industry, about 15 companies from both countries would be candidates for the Franco-German team, but no details as to who will participate and who should take on which tasks have been given. In part, these are companies that are also represented in the UK or offer capabilities that no team can easily dispense with.

The British team is pursuing a more global approach, also reaching out beyond Europe to partners in Asia or Amerika. Some companies have already expressed a general interest (e.g. Boeing) but so far, there has been no notification of any formal arrangements. In order to maintain the "leading role of Great Britain in the aerospace industry" (a demand that also plays a major role in the new Combat Air Strategy), government and industry seem to be determined to pursue a "build it and they will come" strategy. This approach is supported by a budget of two billion pounds and a very tight plan, which provides for the presentation of a business case by the end of this year essential decisions on capabilities and funding in 2020 and 2025 as well as the achievement of operational maturity around 2035. Thus, Tempest would be about 5 years ahead of its Franco-German counterpart.

Technology

Bird's Eye View for Combat Vehicle Crews

Waldemar Geiger

Every computer player knows that in racing or combat simulations the bird's eye view is the favoured view, as it offers a much better overview than the cockpit perspective, for example. Commanders of combat vehicles have also recognised this for several decades and know that the view "over the hatch" is significantly better for situational awareness than the limited view "under cover".

Many commanders have already paid with their lives for this view "over the hatch", which is why the armed forces have always tried to increase the situational awareness of vehicle crews around the vehicle without having to give up armour protection. Sophisticated optronic systems solved some of the problems caused by restricted fields of view, but were still limited to the vehicle's visual ground perspective.

With the arrival of small and micro drones on the battlefield, concept definers of the armed forces and designers in the industry asked themselves whether such UAS could be used to provide an armoured vehicle crew with additional fields of view and thus improve their situational awareness of the immediate vicinity.

What sounds simple and could be partially implemented in limited test environments failed in practise due to several technical hurdles. Such a system only achieves its real benefit when it is integrated with the combat vehicle. As a result, it must be able to take off and land from vehicles on the move. It must also be able to operate reliably in a "contested battlefield environment". These two points, among others, constitute the main challenge. How can a drone be properly controlled if a reliable connection to the drone cannot be established, as powerful onboard radios and jammers or enemy electronic warfare efforts constantly interrupt the connection?

In addition, the drones currently in use need a stable and levelled platform for take-off and landing. Both cannot be provided by of a combat vehicle on the move. Therefore, the implementation of such concepts took time.

When Denmark opted for the PIRANHA V from General Dynamics European Land Systems-Mowag (GDELS) in Switzerland as part of the modernisation of its own armed forces, comprehensive participation of Danish industry was agreed. One of the results is the cooperation of GDELS with the Danish drone specialist Sky Watch and Reseiwe A/S, an expert for resilient wireless data communication.

According to Michael Messerschmidt, Chief Business Development Officer of Sky Watch, the vision of a vehicle-integrated drone will soon become reality. Sky Watch aims to offer the solution presented at Eurosatory 2018 as a market-ready product as early as in 2019. According to Messerschmidt's specifications, the vehicle crew will also be able to launch, operate and land the UAV while being on the move. The drone will be integrated with the vehicle's battle management system (BMS). This enables the exchange of information between the drone and the vehicle crew. Deployment scenarios could include missions for the drone to explore the way ahead or give the driver and commander an overview from a bird's perspective. Since the loiter time of Multicopter drones is currently around 30 minutes due to the battery capacities, either several drones of a single vehicle or several drones distributed over several vehicles of a convoy can alternately provide extended situational awareness. The drone is controlled by an operator or semi-autonomously, for example by pre-programmed route patterns. In stressful situations, when the operator has to concentrate on other tasks, the drone automatically follows the vehicle using the "follow" function.

GDELS is responsible for the physical integration of the drone with the combat vehicle and the BMS. Sky-Watch contributes know-how in the production of military drones that are able to operate reliably even in harsh environmental conditions and dynamic battlefield situations. Reseiwe's patented ReWiLink technology is used to reliably establish and maintain a communication link between the vehicle and the drone. The drone control is based on Wi-Fi communication. In sub-optimal environments, this digital form of communication suffers from abrupt disconnections, so that data can either flow completely or not at all. ReWiLink is able to stabilise the connection and enable a data flow even in "extreme" situations. Similar to analogue communication, the quality of the connection decreases, but it does not break off. The bottom line is that the connection quality is improved by a factor of two. The implementation is purely software-based, a change of the hardware is not necessary.

With the drone and the patented link to the vehicle, the Danish-Swiss trio could finally fulfil the desire of all vehicle commanders: To provide a bird's eye view to improve the situational awareness of the soldiers on the ground. The view "over the hatch" would thus be history, the view "around the corner" reality.

RECTIFICATION

(df) In our last issue of Spotlight we wrote that "the landing of the MQ-9B Sky Guardian at the Royal Airforce (RAF) in Fairford (UK) on July 11, 2018 marked the successful completion of the first remote-controlled transatlantic flight of an unmanned MALE (Medium Altitude Large Endurance) class aircraft". As we have to admit, this is simply


(Photo: Euro Hawk)

not true. Even though it was announced by the companies this way, our readers new better. The real first remote controlled transatlantic flight of an unmanned MALE took place in 2011.

On July 20, 2011 a Euro Hawk landed in Manching (Germany). Almost 24 hours earlier it had started from the Edwards Air Force Base in California (USA) with several pilots from Germany and the U.S. monitoring the flight from the ground.

Please forgive our mistake!

Doppler GPS Navigation Systems For U.S. Black Hawks

(df) The U.S. Army's Black Hawk helicopters will receive touch screen computer display units (CDU) as an upgrade to the company's ASN-128 Doppler GPS Navigation System. The self-contained, all-weather, day or night navigation system enables Black Hawk pilots to view real-time flight plan data. This task order was awarded to BAE Systems under a current $226 million contract. The initial order of 250 CDUs will be delivered in 2019 and 2020.

The Doppler Navigation Systems provide accurate, independent, jam-resistant navigation in friendly and hostile environments and in operational situations where interference with GPS is likely. The system automatically selects Doppler navigation in GPS-denied environments.

BAE Systems' AN/ASN-128 operates on more than 15,000 helicopters in 35 nations.

"We've been a supplier for the ASN-128 program since 1978," said Alan Dewar, director of Communications and Navigation


(Graphic: BAE Systems)

Solutions at BAE Systems. "The full touch screen with moving map capability will improve safety for pilots, assisting our customer's mission success."

www.baesystems.com

First DURO I WE In Service

(cl) For the first time, the Swiss Army has used overhauled Duro I WE for the transport of recruits. After extensive modernisation and life extension measures (WE), General Dynamics European Landsystems (GDELS) over the first 40 enhanced and life extended DURO team transporters to armasuisse. Companies from various areas of Switzerland were involved in the work.


(Photo: GDELS)

Within this modernisation the basic vehicle was refurbished, a new engine including particle filter and modern vehicle electrics and lighting were installed. The brake system has been revised. Anti-lock braking system and an electronic stability programme support the driver. The new crew construction has an integrated rollover protection and a 4-point harness system.

The Army Logistics Base (LBA) is now phasing the vehicles into service, for the first time at the Summer Recruit School 2018, with the aim of gathering further information about DURO I WE.

Delivery is scheduled for 2022.

www.ar.admin.ch/de

Test Shooting Successfully Completed

(wg) Hirtenberger Defence Europe (HDE) recently carried out a series of internal firing tests at the Felixdorf shooting range. The test series included technical adjustments of ST Engineering's Super Rapid Advanced Mortar System (SRAMS) and the Hirtenberger 120 mm mortar ammunition as well as the training of the HDE operating


(Photo: Hirtenberger)

team on the automated mortar system. In June, at Eurosatory in Paris, a cooperation between HDE and ST Engineering was agreed to jointly market the SRAMS in Europe. With a system weight of less than 1.2 tons and a maximum recoil of 26 tons (when fired with maximum charge), the SRAMS can also be integrated on light vehicles. Another test firing in the presence of an expert international audience is planned for September 2018.

hds.hirtenberger.com

Germany Gets Medical Version Of A400M

(df) Presentation of the medical version of the A400M took place in Berlin-Tegel on July 31. The interior consists of six hospital beds including the associated material – like medication – for transporting the wounded. Even though the term "flying intensive care unit" has become established for this module, it is rather a flying ambulance, since it is only used for transport, not for medical care or surgery. Although the presence of qualified medical personnel also ensures professional care in emergencies.

In the event of an emergency, A400M is intended primarily for the so-called relieving transport of wounded persons in order to ensure better distribution and thus also care for patients.

The German A400M have different modules that can be installed in order to be quickly suitable for a wide variety of tasks. The flying intensive care unit is now the latest module that the Bundeswehr has fully operational. "We need three to four hours to set up everything here," said the Medical Director of the flight, Dr. Axel Höpner. Höpner especially praised the quiet and stable flight characteristics of the A400M. "If you know the Transall, it is like switching from a vintage car to a modern SUV."

The pilots also praised the flight characteristics of the A400M. Above all, the strain on the flight crew in the modern transport aircraft has been greatly reduced. While in the Transall the pilot's business was mainly flying, in the A400M he is more an aircraft manager with monitoring and decision-making functions. Even though the A400M

initially had teething troubles, the crew in the cockpit agreed: "It is a great plane."

www.airbus.com

British Typhoons Get Smart Self-Protection System

(df) The British Typhoon aircraft will receive a new pyrotechnic smart self-protection system from Saab to defeat radar- and IR-guided threats. The order is part of a framework agreement with BAE Systems consisting of development, production, support and future sales of the Smart Dispenser System (SDS), a pyrotechnic smart self-protection system. SDS is the latest generation in Saab´s BOP family of pyrotechnic countermeasure dispensers. BOP


(Photo: Saab)

is in-service on fighters and other combat aircraft types, and has been proven over several decades including on active operations.

"This new smart dispenser system provides a significant increase in self-protection capability to defeat modern threats by dispensing optimised countermeasure sequences and directions.", says Anders Carp, head of Saab business area Surveillance. "Saab's electromechanical self-protection system BOL has been in use on Eurofighter since its inception, and we are now looking forward to strengthening the platform's countermeasure capability through SDS."

The development and integration work of SDS is expected to be finished in the 2020 timeframe.

www.saab.com

Laser-Guided Sidewinder

(gwh) As part of the "Propelled Short-Range Effector" defence programme for the Bundeswehr Tornado fighter jet, the Federal Office of Defence Technology, Information Technology and In-Service Support (BAAINBw) is completing development work on the Laser-Guided Sidewinder (LaGS). The goal is the procurement of 300 LaGS guided missiles before the end of this year.

(Graphic: Diehl Defence)

The introduction of a semi-active laser seeker (SAL) makes it possible to cover new application scenarios, e.g. with stationary and mobile targets in an urban environment, without having to integrate a new missile into the aircraft at great expense.

The air-to-surface LaGS for different carrier platforms is an offspring of the worldwide proven Sidewinder air-to-air missile family. Due to existing air vehicle interfaces, considerable costs for renewed integration can be avoided.

The missiles measurements, weight, center of gravity and inertia remain unaltered; nor are the interfaces to the launcher air vehicle subject to change. Therefore LaGS will offer full compatibility with the Sidewinder weapon station.

www.diehl-defence.de

RBS15 Mk3 For New German Corvettes

(df) Saab announced it has received an order from its German partner Diehl Defence for the RBS15 Mk3 Anti-Ship Missile ship system. The order has several priced options related to Integrated Logistic Support (ILS) and IT Security. Deliveries will take place during the period 2019 to 2024.

Recently the German Navy made a decision to buy additional K130 class ships; this order comprises onboard ship systems for these. The order contains the necessary infrastructure to equip the ships with the RBS15 missiles. The order was received from Diehl Defence, industrial prime for the RBS15 procurement in Germany. The contractor is a German consortium of three shipyards named ARGE K-130.

"The order is important for us in the long-term cooperation with our partner Diehl. This order can also be seen as a first step in equipping the ships with our missile, which I see as an opportunity for future orders of the RBS15", says Görgen Johansson, Head of Business Area Dynamics.

RBS15 is jointly produced by Saab and Diehl Defence GmbH & Co and serves with


(Photo: Diehl Defence)

armed forces from Sweden, Finland, Germany, Poland, Croatia, Thailand and an undisclosed country.

www.diehl-defence.de

www.saab.com

New Corrosion Resistant Chock Liner

(df) "The transition from steel wire rope to fibre rope is widespread across industry. Fibre rope has a good strength to weight ratio and ease of handling, resulting in much lower risk of injury. Although advantageous, a major weakness of fibre rope is poor resistance to external abuse and abrasion through everyday operations and poor surface contact," the company Nylacast explained with the introduction of their Chock Liner with its patented low friction technology supporting safe and reliable moorings of vessels of all types and purpose. "Abrasion continues to be one of the most common root causes of rope failure and reduction in its residual strength. It is impossible for synthetic rope to perform to its maximum capabilities when

(Photo: Nylacast)

used with poorly maintained deck equipment, often rusted or with a rough surface finish. Rope manufacturers recommend surfaces are correctly prepared, maintained and routinely inspected before and after rope installation. A 300-microinch finish (7.62 microns) is recommended for all deck hardware which comes into contact with the rope, in addition to the avoidance of chocks heavily scored from previous wire rope use."

According to the company the now presented Chock Liner mooring technology will provide vessels with the ability to be moored with greater safety, performance and efficiency. The Chock Liner's smooth surface and finish and its material characteristics provides better equalisation of mooring loads, especially when in high swell. The self-lubricating, low friction Chock Liner material requires little or no maintenance and no painting, coating or external protection. Corrosion resistant materials technology is featured on the Chock Liner, providing protection against the arduous environments faced in the global maritime industry.

Nylacast was awarded the British Engineering Excellence Award for Material Application of the Year in 2015 and 2016.

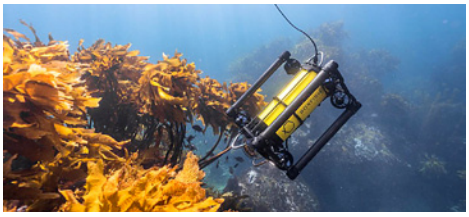
www.nylacast.com

Underwater Camera Drone With High Mobility

(cl) Boxfish Research has introduced its new Boxfish ROV underwater camera drone. A 4K camera is integrated into the remote-controlled underwater vehicle, which can stream uncompressed UHD videos (Ultra HD) to the base station. In addition to this main camera, there are ultra-wide angle pilot cameras (1080p) so that pilot and cameraman can act separately.

The drone is equipped with two dimmable 10,000 lumen LED lights on both sides of the 6-inch domelight for operation at depths of up to 1,000 meters. The on-board battery offers three to six hours of operation.

The Boxfish ROV weighs 25 kg and is powered by eight revolving engines, each delivering 20 kg of thrust. Because the engines are mounted around the device and point in different directions, the drone is stabilized, which has a positive effect on the film material.


(Photo: Boxfish)

The rope spindle offers 1,500 m of light rope. The built-in navigation computer can transmit the position. The drone has a heading lock, depth lock, setting lock and automatic ascent function.

www.boxfish-research.com

Industry & Trade

Consortium For Satellite-Based Quantum Key Distribution

(df) The AIT Austrian Institute of Technology announced it joins a freshly formed consortium comprising leading European research and industry organisations working on a next generation satellite-based cybersecurity system. The consortium led by the world-leading satellite operator SES and supported by the European Space Agency (ESA) aims to develop Quantum Cryptography Telecommunication System (QUARTZ). QUARTZ applications will address the needs of users such as telecommunication operators, financial organisations, infrastructure providers, institutions and governmental organisations.

The members of the consortium are: SES (Coordinator), AIT Austrian Institute of Technology GmbH, German Aerospace Center (DLR), ID Quantique, itrust consulting, Ludwig-Maximilian University, LuxTrust, Max Planck Institute for the Science of Light, Palacky University, Tesat-Spacecom, and TNO.

Quantum Key Distribution (QKD) is a method for secret key agreement based on optical communication with quantum signals. It is fundamentally different from classical cryptography and is currently the only known method that will be provably secure against attacks from future quantum computers. Satellite-based QKD can overcome the distance limitations of several hundred kilometres still present in fibre based QKD systems.

Over the coming three years the AIT experts of the optical quantum technologies research group will create next generation software to enable the distribution of secure keys between optical ground stations on earth that will all be connected by quantum links with a quantum enabled satellite. This will achieve a reliable, globally available cybersecurity system and deliver next-generation encryption keys to networks in geographically dispersed areas, thus leveraging the unique advantages of satellites, including global reach and unlimited coverage.

The QUARTZ consortium will define, design and develop a satellite-based Quantum Key Distribution (QKD) system and service architecture, which will include the future service and the core technologies, as well as ground end-to-end testing.

www.ait.ac.at

MASTHEAD

ESD Spotlight
Email newsletter of the magazine
"European Security & Defence" (ESD)

Editor-in-Chief: Dr. Peter Bossdorf
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Layout: Dorothee Frank

MITTLER REPORT
Published by
Mittler Report Verlag GmbH
A company of Tamm Media Group

Mittler Report Verlag GmbH
Baunscheidtstrasse 11
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The company is located in Bonn
District Court of Bonn – HRB 18658
Identification number DE 811 223 089

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Rheinmetall Announces Successful Performance

(df) Rheinmetall presented another rise in consolidated operating earnings for the first half of the year today. "We have successfully increased earnings in the Group overall and continued to improve our operating margin", said Rheinmetall's CEO Armin Papperger. "Given the good development, especially in the second quarter, we are confident of achieving the targets we have set ourselves in the current fiscal year. We want to keep growing profitably and building on our positions in international markets. We are helped here by the fact that we are convincingly represented on the key growth markets with our pioneering technologies."

The Rheinmetall Group's sales decreased by €55 million or 1.9% year-on-year to €2,753 million in the first half of 2018 (previous year: €2,808 million). Consolidated operating earnings rose by €20 million or 15% to €154 million. The Group's operating margin thus grew from 4.8% to 5.6%.

The Defence sector of Rheinmetall was also able to continue with a positive trend. At €1,427 million, incoming orders for the Defence sector in the first half of 2018 remained at the high level of the previous year (H1 2017: €1,422 million) despite negative currency effects of €-33 million.

Larger individual orders were an order in the Weapon and Ammunition division from an international customer worth around €380 million for the delivery of artillery and tank ammunition and an order in the Electronic Solutions division worth €102 million to supply air defence products in Asia. The order backlog totaled €6,510 million, down slightly on the previous year's figure of €6,661 million.

www.rheinmetall-defence.com

4th International Symposium on Development of CBRN

The 4th International Symposium on Development of CBRN will once again provide a professional platform for encounters and exchange of the international CBRN protection community. International experts will inform representatives from the fields of politics, administration, industry, academia, civilian and military organisations about latest developments in security policy and provide an up-to-date risk assessment with a view to chemical, biological, radiological and nuclear risks and the challenges they represent for military and civilian systems when it comes to hazard prevention.

September 3-5, Berlin, Germany

DARPA's 60th Anniversary Symposium

D60 is a three-day Symposium hosted by DARPA in honor of its 60th anniversary. The Symposium will highlight DARPA's innovative approach to creating breakthrough technologies and capabilities from the Agency's past, present, and future. DARPA's mission requires a constant stream of novel ideas and contributions from innovators looking beyond what is possible now. D60 will provide attendees the opportunity to engage with up-and-coming innovators, scientists and technologists, as they continue to provide these contributions.

September 5-7, Washington, USA

MS&D – International Conference on Maritime Security and Defence

In its 10th year of existence, MS&D – the international conference on maritime security and defence – will attract more attention than ever. During the extended two-day conference, speakers and lecturers will address pressing topics – including cybersecurity, climate change and naval technology. Be part of it and seize the opportunity to get together with high ranking global delegations.

September 6-7, Hamburg, Germany

SAHA EXPO

The exhibition which is organised by Turkey's largest Defense and Aerospace Clustering Association, SAHA ISTANBUL, aims to bring together the national and international leading manufacturers that produce special products and systems for the defense industry, civil aviation and space industry. The exhibition, where advanced technological developments in these sectors will be exhibited, will also be a meeting place for representatives of public and private institutions and procurement delegations from domestic and foreign countries.

September 13-15, Istanbul, Turkey

SOBRA 2018

SOBRA 2018, the 7th International Fair of Defence, Security, Protection and Rescue, will present equipment, know-how and the most important institutions that provide defence preparedness, citizen security as well as protection and rescue in natural and other disasters. It will offer professional exhibitions and conferences, with advice for visitors, dynamic presentations, as well as educational and social events in which among others the Ministry of Defence of the Republic of Slovenia, the Slovenian Armed Forces, the Police will participate.

September 20-23, Gornja Radgona, Slovenia

ADEX

Azerbaijan International Defence Exhibition, ADEX, is the largest event in the region, the aim of which is to present a wide range of military products while promoting the innovative development of the Azerbaijani military-industrial complex. The exhibition is also a platform for cooperation between foreign arms-producing companies and the Azerbaijani military departments and defence industry enterprises.

September 25-27, Baku, Azerbaijan

FUTURE FORCES FORUM

International exhibition and expert events on the latest trends and technologies in defence and security. All events are focused on the presentation of needs of armed and security forces, state-of-the-art technologies, R&D programmes, and business opportunities, with interactions between all participants due to the interconnected topics. Government, international organisations, industry, R&D institutions meet at one place. NATO and the European Defence Agency are involved in shaping the programme.

17 - 19 October, Prague, Czech Republic

TechNet Europe 2018

The two-day conference organised by AFCEA Europe in cooperation with the AFCEA Rome and Naples chapters, will be held under the patronage of the Ministry of Defence, Italy. Representatives from some of the highest levels of the European and NATO institutional, academic and industrial world will discuss the current situation, challenges and the various prospects of Maritime Situational Awareness.

November 6-7, Sorrento, Italy

FUTURE ARMOURED VEHICLES SURVIVABILTY

As the only event purely dedicated to the area of vehicle protection, Future Armoured Vehicles Survivability 2018 will deliver a strong focus on the relationship between current requirements, emerging technologies and how these might be leveraged to enhance force protection. Building on 2017's focus day, SMi will host an exclusive pre-conference Active Protection Systems focus day, dedicated to this important capability.

November 13-15, London, UK

NIDV-Symposium – 30th edition

During the NIDV-Symposium and exhibition, more than 130 companies show their potential. The top political level of the Ministries of Defence, Economic Affairs, Foreign Affairs and Security & Justice are invited. A special programme for the military attachés accredited in the Netherlands is offered. Sister organizations of the NIDV from abroad are also invited. And last but not least, representatives of the armed forces, the police, the fire brigade, the ambulance dispatch center, the coast guard and other public security organizations are present.

November 15, Rotterdam, The Netherlands

I/ITSEC

The Interservice/Industry Training, Simulation and Education Conference (I/ITSEC) is the world's largest modeling, simulation and training conference. It consists of peer-reviewed paper presentations, tutorials, special events, professional workshops, a commercial exhibit hall, a serious games competition, and STEM events for teachers and secondary students. I/ITSEC is organized by the National Training and Simulation Association (NTSA).

November 26-30, Orlando, USA

EDEX – Egypt Defence Expo 2018

Held under the patronage of His Excellency, President Abdel Fattah El Sisi, President of The Arab Republic of Egypt, The Supreme Commander of The Egyptian Armed Forces, Clarion Events is proud to present EDEX – Egypt Defence Expo 2018. EDEX is fully supported by the Egyptian Armed Forces and presents a brand new opportunity for exhibitors to showcase the latest military technology.

December 3 - 5, 2018, New Cairo, Egypt