

SPEKTRUM



AIRSPACE SECURITY TO THE POWER OF THREE

Drone defence
with GUARDION

DRONES FOR SECURITY
AND INSPECTION

EDITORIAL

Spektrum II 2019

Take advantage of technological opportunities – Promote innovative strength – Invest in the future

The second half of our financial year has also been distinguished by the successful implementation of a great variety of technological projects and the targeted further development of our corporate orientation.

The diversity of individual projects within the technological focal points can be seen right at the start of this issue of our company magazine: Unmanned flying systems do not just present a hazard to critical infrastructure but rather they also offer many opportunities for the successful management of future challenges, for example, in the fields of logistics, mobility and internal and external security.

The targeted utilisation of these technology-based opportunities throughout different industries and the simultaneous investment in innovative capability and innovative strength have not only been characteristic of the whole ESG group for many years now, they have been the recipe for the group's success. We are continuing on this path unchanged, together with you and our whole highly committed and capable ESG team.

We hope you enjoy reading the articles and wish you all the best for the Christmas holidays.

We wish you and your families much happiness, success and good health for the new year and we look forward to realising exciting and innovative projects together in the coming year.



Jörg Ohlsen
Member of the Board



Dr. Mihaela Seidl
Member of the Board



Kai Horten
Member of the Board



CONTENT

- 02 Editorial
Spektrum II 2019
- 04 Airspace security to the power of three
Drone defence with GUARDION
- 08 Airport drone defence
GUARDION impresses the specialist audience at live demo
- 10 Drones for security and inspection
ESG at the New Mobility World
- 12 Two weeks of battle dress and camouflage
instead of office
The ESG team at the Luftwaffe's 107th InfoDVag
[Armed Forces information event]
- 14 Adler III for the Lithuanian artillery
ESG receives the NSPA order
- 15 Investing in the future
ESG expands the company headquarters in
Fürstenfeldbruck
- 16 Open Skies for the Bundeswehr
Observer with ESG mission system on board
- 20 Boeing and ESG
Cooperation in the competition for the
Bundeswehr's new heavy transport helicopter
- 22 Paris Air Show 2019
ESG sows the seeds for future topics
- 26 Performance-based logistics
ESG and the Bundeswehr university in Munich
on course for innovation
- 29 Training and further development for
healthcare professionals
ESG presents innovative VR simulation
solutions
- 30 ESG technology forum 2019
Open innovation in the real world
- 32 Faster, clearer and more up-to-date
ESG MOBILITY at the BMW Group IT trade fair 2019
- 34 Intelligent charging of electric cars
ESG MOBILITY thinks "on demand"
- 36 ESG Mobility and Vector
Cooperation for controllable electrical/
electronic systems
- 37 Foundation stone for the next centre of
competence
ESG Mobility opens a branch office in Fulda
- 38 Incident Detection & Response
How to avoid the three most common errors
- 41 "Des mach ma!" [We can do that!]
CYOSS at the 3rd Action Day
for Munich companies
- 42 The team spirit counts
Company fun run 2019
- 43 The German scholarship at ESG
Scholarship student Magdalena Fuchs'
experiences

Legal notice

Publisher:

ESG Elektroniksystem- und Logistik-GmbH
Livry-Gargan-Straße 6, 82256 Fürstenfeldbruck
Tel.: +49 89 92161 2850
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Print: Blueprint AG, Munich

AIRSPACE SECURITY TO THE POWER OF THREE

Drone defence with GUARDION

Ever more commercial enterprises and infrastructure companies are becoming aware of the necessity of drone defence. For example, flying spies over Volkswagen's own company test track have been a thorn in the company's side for many years. But airport operators too, who recorded 125 incidents due to drones in Germany alone last year, must realise that effective solutions are required.

Whilst awareness of threats due to uncooperative drones has increased, we have sharpened GUARDION's profile. Since June the focus has been on the new market launch – what makes GUARDION unique and differentiates it from competitors' solutions. It is the increased expertise of the three companies ESG, Rohde & Schwarz and Diehl Defence, that combines the decades of experience and well proven 'know-how' with the agile innovation of specialised European high-tech business leaders. Customers can expect maximum reliability in all areas of the congenial drone defence system from this cooperation.



DETECT

GUARDION is ideally equipped for the automatic detection and classification of drones. Drones and pilots are precisely tracked down through the state-of-the-art multi-sensor portfolio of high frequency, radar, video and acoustic monitoring systems, even in dense and overloaded spectrums.

REACT

All threads come together technically in the intuitive command centre. It is interoperable with national and international standards and a broad palette of interfaces, including military. Very high computing power enables positional visualisation in real-time. In doing so, the clear presentation facilitates rapid decision-making.

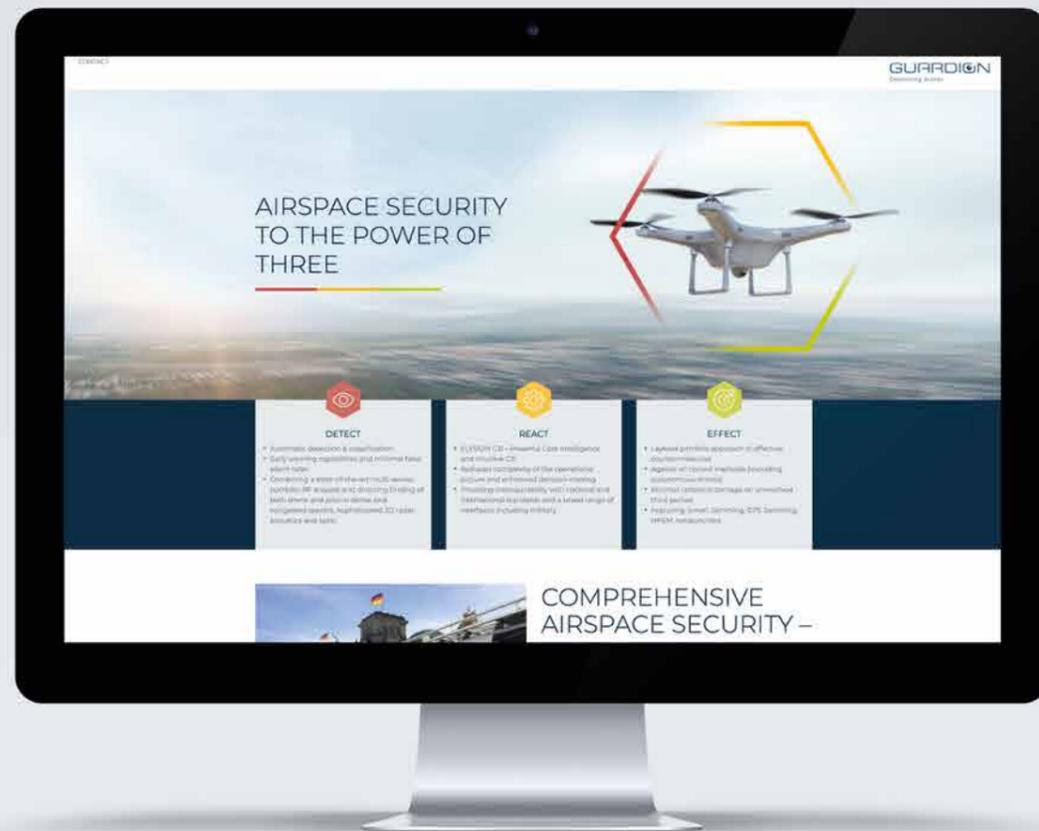
EFFECT

In order to effectively and appropriately counteract each drone, GUARDION is equipped with modular defence measures including Smart Jamming, GPS-Jamming, WiFi-interruption, HPEM (High-Power Electro-Magnetics) and web launchers – also to minimise potential collateral damage to uninvolved third parties.

As is normal for ESG systems, GUARDION has been developed around customer wishes. For this reason, right from the start, the focus was on developing a practically oriented solution that would operate in the best interests of the users on site and under pressure. Companies and institutions have the common goal of protecting their business activities from unauthorised interventions and disruptions.

With GUARDION you have a protective shield against possible threat scenarios.

DETECT REACT EFFECT Triple security from drones



NEGLIGENCE

Whether deliberate or not: The illegal ingress into no-fly zones at airports or at major events impairs processes and disrupts operations. It is not uncommon for such incidents to involve financial damage and have possible legal steps.

CRIMINAL INTENT

Industrial espionage by means of photography and filming endangers intellectual property rights and commercial secrets. Smuggling of goods, communications equipment or weapons into correctional facilities infringes rights and laws and can represent a hazard to life and limb. With GUARDION, the interests of business and general public safety can be assured.

TERRORISM

From reconnaissance flights to the air-dropping of propaganda leaflets or even explosive devices – all scenarios of conflict zones have already occurred. These hazards for personnel, property and exposed critical infrastructure such as military bases must be warded off.

ORIENTED AROUND CURRENT NEEDS AND FUTURE NEEDS

In order to provide solutions to customers from the military, law enforcement, infrastructure and the private sector, that are individually tailored and future-proof, GUARDION has a modular and scalable toolbox design. The system can be deployed in four different forms: Mobile in a vehicle, as an out-of-the-box solution for agile deployment, in a container that can be stationed anywhere in the world or as a permanent, stationary solution. Everything has been considered with GUARDION to ensure that customers can achieve and benefit from perfect results.

We clarify the prerequisites with hardware-agnostic advice and harmonise the system with the applicable legal framework conditions as well as UTM networks, manage the integration into existing infrastructure and security architecture, ensure that the users are 'good-to-go' with comprehensive training and take care of the maintenance – globally.

GUARDION has already proven its effectiveness at many security-critical events: 2015 at the G7 summit in Ellmau, 2016 at US President Obama's visit in Hanover, 2017 at the G20 meeting in Hamburg, 2018 at the leading aerospace trade fair ILA as well as at the celebrations for the anniversary of German unification in Berlin. And now the Volkswagen group has also joined this impressive list of references. As the first customer from the private sector VW has placed an order for GUARDION as a mobile drone detection system based on a VW Crafter for use in the company. So, inquisitive snapshots and video recording of prototypes on the test track will soon be a thing of the past.

THE FULL POTENTIAL Against potential threats



YOU CAN FIND MORE DETAILED INFORMATION DIRECTLY ON THE GUARDION WEBSITE AT www.guardion.eu

AIRPORT DRONE DEFENCE

GUARDION impresses the specialist audience at live demo

In the summer, the GUARDION team demonstrated their capability as a reliable technology partner with their successful mastery of the challenge of "reliable detection and defence against hazards due to uncooperative drones".

Against a backdrop of a growing number of security incidents at national and international airports, the demonstrations of drone scenarios are oriented towards airports.



1 – 3 Effective protection: Different sensors and effectors integrated into a scalable system in accordance with requirements



Alongside GUARDION's cooperation partners, Diehl Defence and Rohde & Schwarz, who were there from the outset, selected technology and product partners such as OpenWorks Engineering, RobinRadar, Trakka, Squarehead Technologies and Hensoldt also provided support at the live demo. This enabled the whole effect chain, DETECT – REACT – EFFECT, to be impressively demonstrated, including the effective use of the Skywall net launcher.

In a highly complex scenario set-up with different civil and military sites, the GUARDION team were able to impress the professional visitors, including senior personnel with responsibility for airport security, representatives from the federal and state police forces, representatives from German flight safety and from industry, with the solutions and concepts as well as with the holistically demonstrated operational performance.

The participants were very impressed, particularly with the open handling and clear expression of the individual technological challenges: "We didn't want a 'faked' glossy presentation, but rather dependable technology partners who know what they are doing and what is actually technologically feasible and practical", stated the security manager of a major airport.

Within the course of the concluding discussion, numerous follow-up appointments were agreed to arrange potential test installations at airports as well as concrete orders for official deployments of GUARDION at events in the coming year.

A team from Bayerischen Rundfunk [Bavarian radio broadcasting service] also made use of the occasion for radio and television interviews as well as for background discussions.

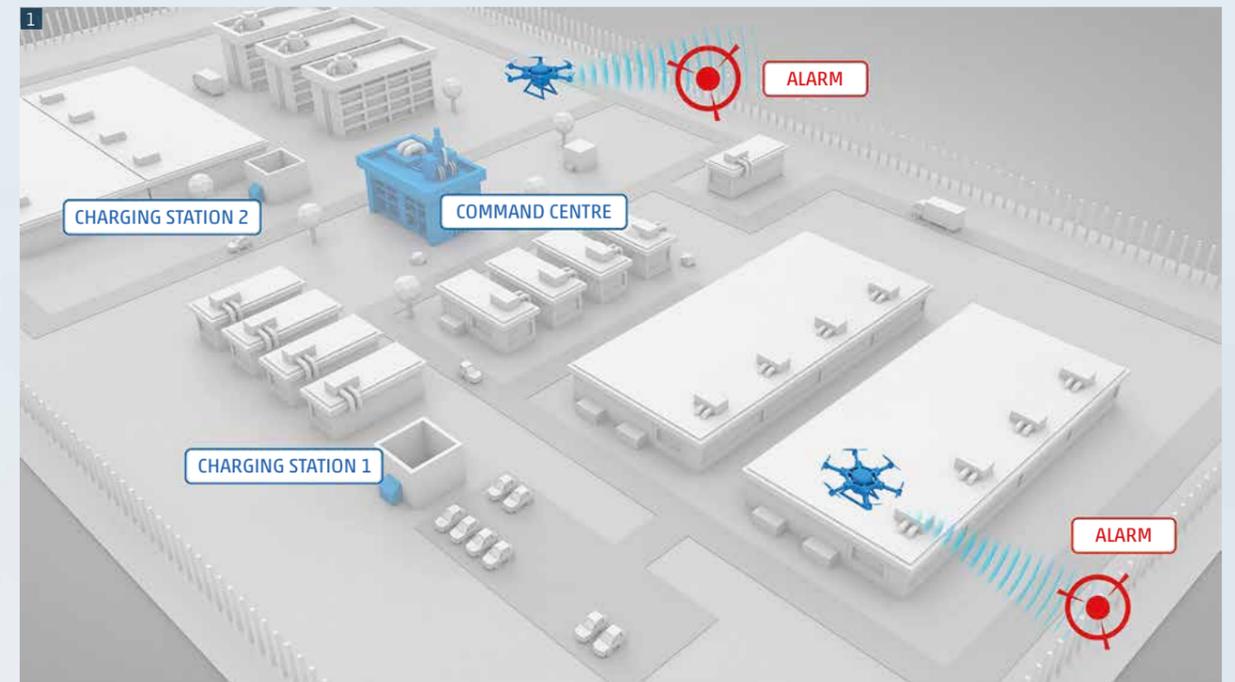
YOU CAN FIND MORE
DETAILED INFORMATION AT
www.drohnenabwehr.de



DRONES FOR SECURITY AND INSPECTION

ESG at the New Mobility World

The ESG group presented their joint work on an autonomous and approvable complete drone system at the international platform for changing mobility solutions.



1 Future-oriented and scalable: Complete drone system from ESG for security and inspection applications

Drones are currently attracting a great deal of public attention. A billion-euro market is associated with them. Alongside the three-dimensional mass mobility that is often cited in the media and that lies in the distant future, there is already a very promising potential for clever drone solutions in the fields of security, logistics and inspection, with some significant savings potential compared to the systems currently used.

The existing technology has already reached the critical tipping point for these types of applications: The experts from ESG Mobility GmbH and ESG Elektroniksystem- und Logistik-GmbH presented their joint solution at this

year's New Mobility World within the scope of the international automotive exhibition (the "IAA"): With the AUTOMATIC DRONE SECURITY product, work is being done on an autonomous, approvable complete drone system that should reach the market for security and inspection applications in the medium term.

INTELLIGENT swarm control

The heart of the system is the intelligent swarm controller that, as the name suggests, is intended to control a complete swarm of drones. In this product, the ESG group combines the central core skills: security-relevant system development, profound (autonomous) aerospace expertise, real-time data processing and advanced image recognition.



TWO WEEKS OF BATTLE DRESS AND CAMOUFLAGE INSTEAD OF OFFICE

The ESG team at the Luftwaffe's 107th InfoDVag

[Armed Forces information event]

For the participants in the Armed Forces information event for civil executives (InfoDVag), it was the first time for them to swap their everyday office routine for Bundeswehr battle dress for two weeks. Our colleagues Elena Ackermann and Frank SchleeHuber were a part of this.

They had the opportunity to become part of the Luftwaffe team in Schleswig-Holstein and to be involved in numerous exciting and in some cases also challenging programme points with the unit. For the duration of the Luftwaffe's 107th Armed Forces information event, the comrades were promoted to First Lieutenant by Brigadier General Holger Neumann, the deputy commander of the General Staff College of the Bundeswehr, and Colonel Michael Skamel,



1 Solemn moment: Promotion to First Lieutenant

2 Challenging and demanding: The final exercise of the Luftwaffe's 107th InfoDVag [Armed Forces information event]

©Images: Bundeswehr/Schmidt

commander of the Luftwaffe's NCO School. The award of the provisional rank enabled the participants to be incorporated into the military event not only as "visitors" but rather as real comrades.

With the InfoDVag the Bundeswehr are able to give people who have little or no experience with the Bundeswehr and the military in general, as comprehensive an insight as possible into the daily routines of the troop within the course of their information activities. At regular intervals (twice per year) all of the armed services or organisational areas of the military pass on information about basic duties as well as current information about ongoing Bundeswehr deployments within the course of the InfoDVag. The participants also learn how life is organised in the Bundeswehr and how each individual increases their mental and physical capabilities in a targeted manner. This includes the military salute, basic instruction on duties and orders in the Bundeswehr, along with marching, safe handling of personal equipment, a military patrol or the de-soldiering dialogue for alarm posts. For Elena Ackermann and Frank SchleeHuber, who deliberately utilised the InfoDVag not only for their professional development but also for their personal development, the InfoDVag was full of highlights: The promotion to First Lieutenant, an exciting visit to the Luftwaffe command, tactical Luftwaffe squadron 71, anti-aircraft missile squadron 1, security services regiment 1, the executive transport wing of the federal

ministry of defence and helicopter squadron 64, were all part of the programme.

One of the training sections was shooting with the P8 piston and the G36 assault rifle, where the participants learned correct shooting range conduct and how to handle the weapons safely. In addition, they were also given instruction on how to improve their shot groupings.

With comradely assistance and much commitment, the participants gained some unforgettable impressions. Elena Ackermann and Frank SchleeHuber certainly agree about the two week experience: "We are delighted to have been able to take advantage of this amazing opportunity and to be able to get to know the everyday lives of soldiers - from the inside, so to speak. Through discussions with comrades and daily experiences, we were able to get a fascinating insight into their working lives. More than anything else we were impressed with the professionalism during practical exercises, the camaraderie within the team and the physical resilience of the soldiers who deploy for people's rights and freedom. Although the time at the Luftwaffe was demanding, participating in this has enriched us and enabled us to have a deeper understanding of the soldiers' profession."

ADLER III FOR THE LITHUANIAN ARTILLERY

ESG receives the NSPA order

ESG supports the strengthening of the NATO partners in Lithuania in the field of indirect fire with their C2 system.

The NATO Support and Procurement Agency, NSPA, has entrusted ESG with the provision and integration of the new Command & Control Systems (C2 system) for the Lithuanian artillery on behalf of the Lithuanian ministry of defence.

The Lithuanian army is currently developing their capability specifically in the area of indirect fire and is introducing a new generation of artillery systems to the Lithuanian armed forces. A modern C2 system, which can interact with the C2 systems of other NATO partners, is sought for the command and control of the artillery systems in order to ensure the communication and effective functional capability of common forces. Together with their Lithuanian partner Elsis, ESG realised the new C2 system for the Lithuanian artillery systems, based on the ADLER III.

In the coming months, the Fire Direction Center, Forward Observer, Tactical Air Control Party as well as the METEO-System will be equipped with ADLER III software, robust computers, network components and the necessary power suppliers.

The ADLER-III systems also contain the necessary interfaces to IP radios and GPS receivers. With the tank howitzer 2000 (PzH 2000) the Lithuanian artillery has the most up-to-date indirect fire system in the world. For the ADLER-III systems in the Fire Direction Centers, the communications interface to the PzH2000 for the transfer of the fire commands, munitions management, etc., will be correspondingly adapted.

In order to display a situationally correct positional image in the ADLER III system and to guarantee interoperability to other C2 and management systems, the ADLER III system is equipped with the Information Mediation Service (IMS) as well as the Tactical Situation Service (TSS) from ESG.

ESG's IMS is a standalone service that ensures collaboration between different management systems via international interfaces and both proprietary, national special solutions. For the first time, it makes it possible to connect multiple

nations at the same time via different standards, thus creating a shared situational picture.

This order once again proves the capabilities of the products and solutions from ESG as a specialist in modern, user-orientated and comprehensively interoperable battle management systems.

ESG AS A SPECIALIST in battle management systems

INVESTING IN THE FUTURE

ESG expands the company headquarters in Fürstenfeldbruck

Since November 2007, the leading technology and innovation partner for defence and public security has operated out of the company headquarters in Fürstenfeldbruck. Within the course of ESG's systematic growth, the available capacity of offices, development laboratories, test facilities and even conference rooms has become increasingly tight in the meantime for the more than 770 employees on site and so after thorough planning the management have decided to make a significant investment in the expansion of the site.



Now a sixth multi-storey building will be added to the existing five multi-storey buildings and one of the buildings will also have another storey added. In addition, the number of parking spaces available for employees will also be increased with the expansion of the underground garage. So, by the end of 2020 an additional 250 modern office workstations, over 700 m² of laboratories, twelve conference rooms and six meeting points will be created.

The construction work that started in the summer for the new work spaces for innovative future technologies is progressing quickly and to plan.

With this expansion of the site, ESG manifests their corporate strategy oriented around sustainable profitable growth and puts the infrastructure in place for the development and realisation of innovative ideas for technology-based solutions for their customers' and partners' future challenges.

Graphic: Metrik Architekten GmbH



OPEN SKIES FOR THE BUNDESWEHR

Observer with ESG mission system on board

The Airbus A319 OH with the tactical marking 15+03 is the Bundeswehr's new observation platform within the scope of "Open Skies".

The Bundeswehr accepted the aircraft from Lufthansa Technik in the presence of the former federal minister of defence Dr. Ursula von der Leyen and the minister of state for the foreign office, Niels Annen, on the 21st of June 2019. The A319 OH is currently the most up-to-date aircraft for carrying out missions within the scope of the Open Skies treaty.

The Open Skies treaty is an international agreement on equipment checks whereby the current 34 OSCE member states are permitted to carry out observation flights throughout the whole airspace zone of the treaty area. In doing so, photographs, infra-red images and radar images are permitted to be made of the respective territories. The number of flights permitted annually is also defined by the quota regulation. The treaty area stretches from Vancouver to Vladivostok.

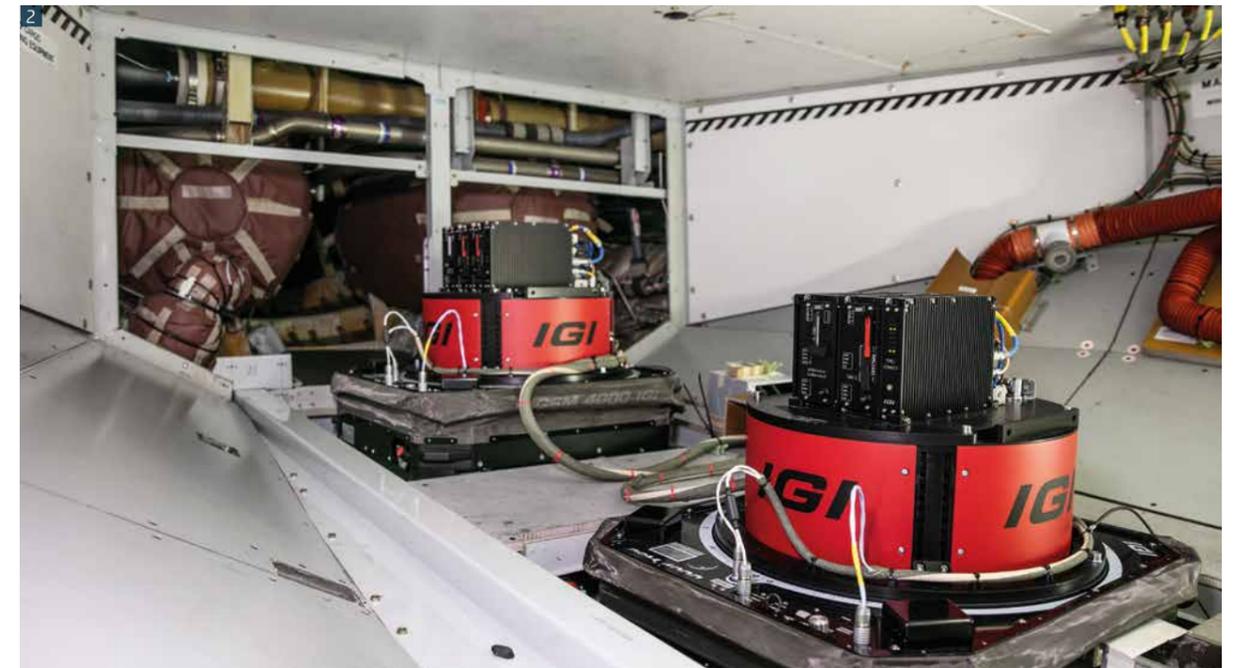
With the A319 OH, Germany has had their own aircraft with which to carry out observation flights within the scope of the agreement once again for the first time since 1997. General contractor Lufthansa Technik furnished an A319 CJ (Corporate Jetliner) with the necessary technology and equipment and converted it accordingly. In doing so, the mission system for the image data was provided by the system specialist for mission installations and equipment ESG Elektroniksystem- und Logistik-GmbH. In less than two years, ESG realised the development, design and civil aviation approval. Within this time around 75 ESG employees in 15 different business units worked together on the highly complex project.

ESG's workshare included the development and airworthiness qualification as well as the certification of the special equipment required for the mission: Starting with the requirements analysis via the design and the hardware and software development and on





1



2

to the integration and implementation of the system tests. The heart of the mission system is the digital optical cameras for three different altitude ranges and a thermal imaging camera. These are controlled by the camera operators via the corresponding workstations in the mission area of the aircraft. The workstations for the mission managers are also located there. They coordinate the proper course of the mission supported by the subsystem for mission planning and implementation.

The cameras are installed in the fuselage of the aircraft. They are mounted on gyro-stabilised platforms to ensure their vertical attitude despite the movements of the aircraft. Four openings were cut in the fuselage and then furnished with special optical panes whose characteristics were optimised to the wavelength range of the cameras. These were developed in cooperation with two American specialist companies and approved for use in the A319. The Germanium pane for use in the infra-red range was "grown" in

THE FULL POTENTIAL for maximum transparency

the laboratory of another partner as a custom-made product for Open Skies.

In parallel to the equipping of the aircraft at Lufthansa Technik in Hamburg, the complete mission system was recreated with original components in a test rig at ESG's premises in Fürstenfeldbruck. With the help of a flight simulator the whole functionality could be intensively tested on the ground and aligned with the operation requirements together with the future system operators. The test rig also enabled the intensive training of the

operating personnel in this early stage, before the knowledge gained in handling the system could be further developed on the aircraft itself.

After the system tests were successfully completed in the laboratory, the complete mission system was installed by Lufthansa Technik into the A319 OH and successfully commissioned on site together with the ESG team.

1 The 15+03 on its way to the first test flights

2 View of the rear freight compartment: The cameras are mounted on gyro-stabilised platforms to compensate for aircraft movements.

© Lufthansa Technik AG, photographer: Jan Brandes

The assessment station is a feature for the further processing of the images taken during the mission. The "Mobile Data Transformation System" (MDTS) is able to create a complete image processing chain through the use of innovative technologies. The images taken are processed from the raw files through to the final Open Skies image product at over one GB per second and duplicated onto four data carriers in a single step. On the one hand this allows the necessary transparency in processing to be guaranteed and on the other hand keeps the downtime in foreign territories as low as possible thus saving costs.

The successful STC acquisition (Supplemental Type Certificate) and the first results taken during the acceptance procedure have shown that the customer is very happy with the system delivered.

After the handover, the A319 OH will now be used intensively by the Bundeswehr's verification centre (ZVBw) in order to prepare for the upcoming accreditation by the OSCE treaty states. ESG will also provide support during accreditation. After that the aircraft can be officially used for the trust-building

tasks within the Open Skies treaty. Beyond the purely German use of the A319 OH, the Bundeswehr also have the option to lend the aircraft to other Open Skies treaty countries to carry out their own missions.



BOEING AND ESG

Cooperation in the competition for the Bundeswehr's new heavy transport helicopter

Boeing expands the German industrial team for the H-47 Chinook with ESG. The agreement encompasses in-service support and life-cycle services.



Boeing and ESG cooperate within the scope of the competition for a new heavy transport helicopter (STH) for the Bundeswehr and announced a corresponding agreement at the 31st international helicopter forum in Bückeburg. The agreement supports the offer of the H-47 Chinook in the German competition for the planned STH and encompasses both in-service support and life-cycle services.

With this cooperation Boeing is expanding its in-service support network and utilising the expertise from ESG in the provision of innovative and highly complex solutions for the Bundeswehr. This includes locally aligned logistics services that will have a positive influence on the efficiency, reliability and technology of the complete STH solution. As a new member of the highly qualified industrial team from Boeing, ESG will

**STATE-OF-THE-ART,
Dependable
and affordable**

provide support for the STH throughout the course of the whole life-cycle.

"We are convinced that we can make a valuable contribution to the future operation of the H-47 Chinook in the Bundeswehr and look forward to the cooperation with Boeing", says Kai Horten, Managing

Director of ESG Elektroniksystem- und Logistik-GmbH, on the occasion of the contract signing.

Michael Hostetter, Vice President Boeing Defense, Space & Security Germany, adds: "ESG has more than 50 years of experience in cooperation with the Bundeswehr. We are delighted to be able to

welcome ESG as a partner in the industrial team for the German H-47 Chinook. We are building a strong team that will assure the maintenance and servicing of the

Chinook throughout the next 40 to 50 years. This way we can integrate additional skills, added value and local expertise into the highly efficient platform and logistics solution. At the same time, the reliability and the low-risk approach, which are the trademarks of the Chinook programme, are still retained."

The industrial plan from Boeing will offer an on-site, long-term support and training solution to the federal government. This encompasses the servicing of the helicopter, the instruction of the crew as well as technical training, research, development and technological solutions as well as the integration of communications and mission systems.

"With the industrial team for the H-47 Chinook, Boeing Deutschland opens up the opportunity to connect with the Boeing supplier network", says Dr. Michael Haidinger, President of Boeing Deutschland. "Boeing values the technological expertise of the German

aerospace industry and is continuing to develop the business opportunities for their supplier network in Germany in all areas of business – Commercial, Defense, Space and Security as well as Global Services."

Boeing is focussed in providing their customers with a low-risk, well-proven and reliable solution, punctually and at a very competitive price. The Boeing H-47 Chinook is a state-of-the-art, dependable and affordable multi-mission helicopter. With more than 950 aircraft in 20 countries, eight of which are NATO member states, the Chinook provides immediate global interoperability at the lowest operating and procurement costs, up to 2065 and beyond.

Boeing and their German industrial team stand ready to support the Bundeswehr and others who will be flying and maintaining the helicopter in the coming decades.



PARIS AIR SHOW 2019

ESG sows the seeds for future topics

From the 17th to the 23rd of June the international aerospace exhibition attracted more than 300,000 visitors – more than half of whom were professional visitors – from all over the world to Paris.

ESG has successfully positioned themselves on the German shared stand as one of the innovation drivers in the security and defence industry and a reliable partner to the armed forces. The following subjects took centre stage:



1 Kai Horten explains the ESG innovations to Lieutenant General Christian Badia

2 Particularly interested in German-French cooperation: Nikolaus Meyer-Landrut, Ambassador of the Federal Republic of Germany in France

3 ESG's Enhanced Vision System

© Cover picture: SIAE

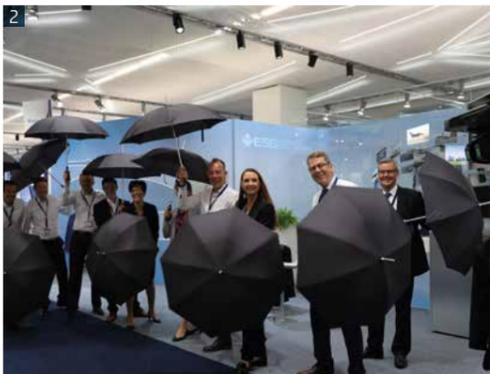
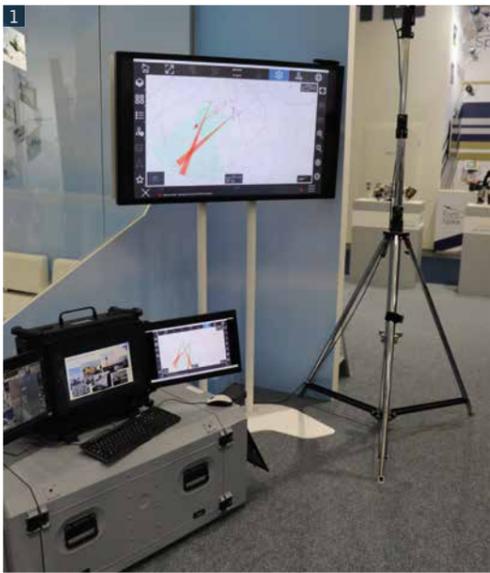


AIRBORNE OPERATOR CONSOLE – THE MODULAR MISSION WORKSTATION FOR POLICE, BORDER CONTROL AND MILITARY MISSIONS:

The Airborne Operator Console is a targeted further development of ESG's well-proven mission workstation, which is already in use, for military and civil missions such as monitoring, search and rescue of missing persons, tracking fugitives and support to ground forces through the use of HD camera systems, digital mapping systems and a multitude of communications options. The ergonomically optimised arrangement of the well-proven touch display, the minimal dimensions of the consoles, a new and more powerful mission computer and mission software that can be adapted by ESG to specific customer requirements, enable a high degree of mission success.

ENHANCED VISION SYSTEM – THE NEXT GENERATION IR CAMERA SYSTEM:

ESG offers an infra-red camera system for flight guidance and mission support for helicopter pilots, that both specifically optimises the situational awareness as well as significantly reducing the workload of helicopter pilots during night flights and in situations with reduced visibility. The dual-band infra-red camera, with medium-wave and long-wave bands, provides a high-resolution and stereoscopic view and improved perception of visual information. The system has a highly dynamic movement platform as well as very low video latency.



- 1 Detect-react-effect: GUARDION
- 2 Armed against rain too: The ESG trade fair team
- 3 Première at the Paris Air Show: SCORPION™
- 4 Happy with the future-oriented cooperation: Future Combat Mission System – FCMS.

GUARDION – THE FIELD-PROVEN, MODULAR DRONE DETECTION AND DEFENCE SYSTEM:

The modular drone defence system GUARDION from ESG and their cooperation partners Rohde & Schwarz and Diehl Defence, is based on a system that has been field-proven many times over and that was successfully used for security at the anniversary of German unification in 2018 in Berlin as well as at major political events such as the G20 summit in Hamburg in 2017, the state visit by US President Obama in June 2016 and the G7 summit in Elmau in 2015. With GUARDION, ESG responds to the need for the selection, integration and networking of powerful sensors, the optimised situational overview through the TARANIS® guidance information and situational display system developed by ESG and the connection to existing IT networks and infrastructure. GUARDION offers scalable solutions, tailored to the respective individual requirements of customers and scenarios, for the secure detection and defence against drones in stationary, mobile or deployable configuration.

PRODUCT LAUNCH - VECTOR™ & SCORPION™ – TACTICAL EVTOL-UAS:

Together with the specialists for the development and production of eVTOL UAS, Quantum-Systems GmbH, ESG presents VECTOR™.

VECTOR™ combines the performance benefits of a fixed-wing aircraft with the vertical take-off capability of a helicopter. The deployment spectrum is additionally enhanced by the 2in1 system. With the simple change in configuration, the VECTOR™ is changed to the SCORPION™ – from a fixed-wing aircraft to a tri-copter, enabling rapid and flexible reaction to different challenges and changing deployment scenarios. Thanks to their design, VECTOR™ and SCORPION™ are ideally suited to tactical reconnaissance and surveillance missions as well as challenging weather conditions.

ESG: PARTNER IN THE GERMAN FCMS CONSORTIUM FOR FCAS

The official signing of the consortium agreement for the Future Combat Mission System (FCMS) for the Future Combat Air System (FCAS) with partners Diehl Defence, Hensoldt and Rohde & Schwarz was not only a trade fair highlight, but was of particular importance for the strategic commitment of ESG in one of the central future programmes – FCAS. The objective of the German FCMS consortium is to take over together the responsibility for the complex subject of the networked use of sensors and effectors in the FCAS network. This is done in close industrial cooperation with the weapons system manufacturers and the respective electronics companies from the participating countries. The strong key technologies of German industry are further consolidated with the

work in the FCMS consortium. It will also create a solid basis for the future development of more flexible, powerful and networked sensor/effector solutions for the current and future weapons systems of the European air forces.

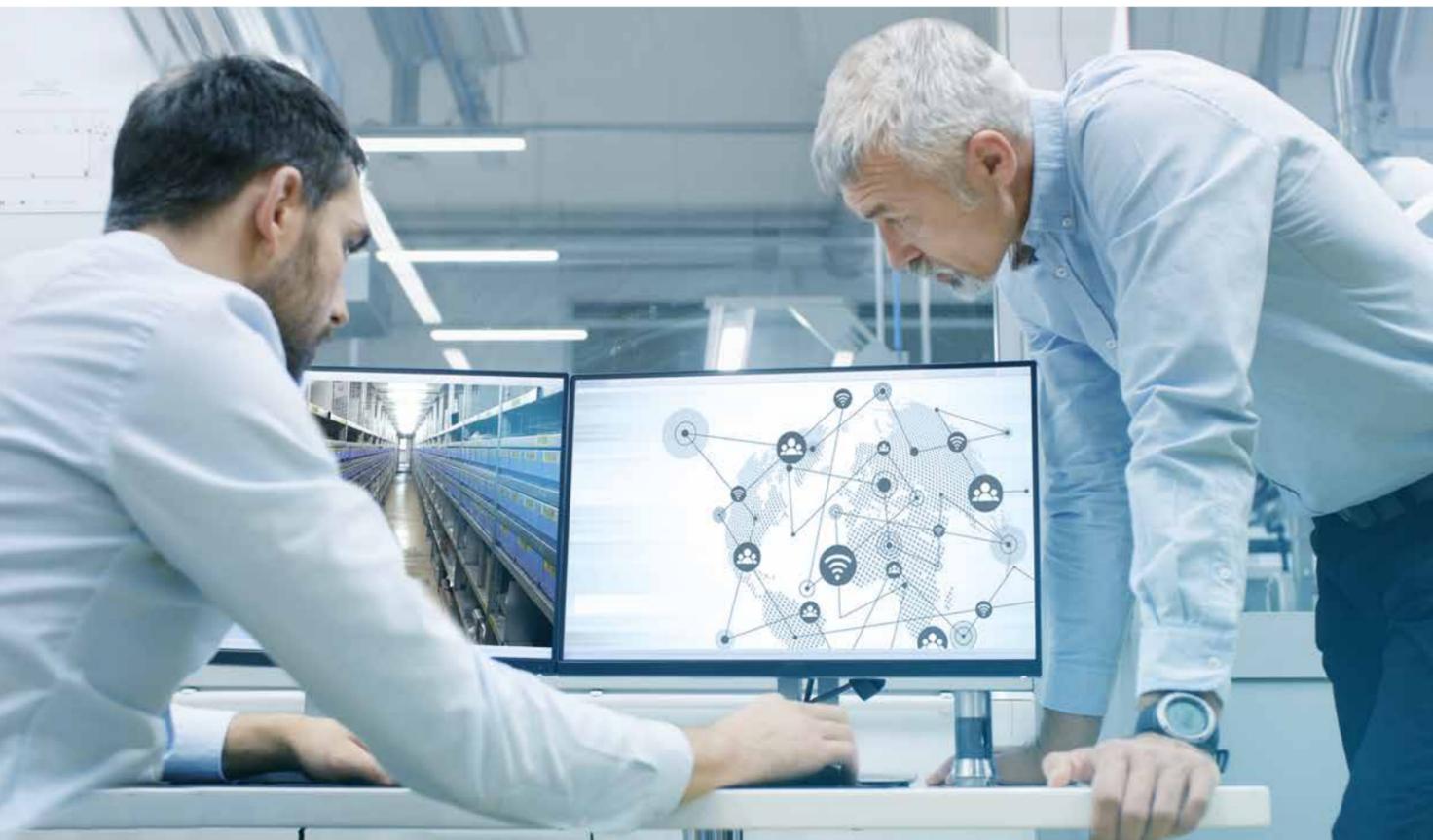
The numerous visitors to our trade fair stand seemed once again to be impressed by the diverse capability as a technology and innovation partner.

In fact, the team could impress with an "Immediate deployment initiative" when there was threat from the air (rain!).

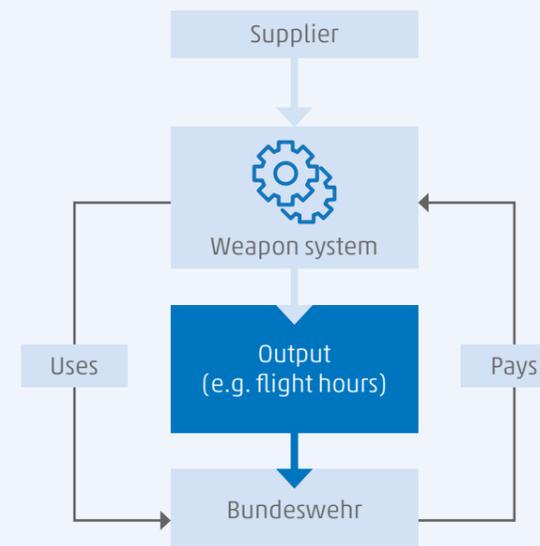
PERFORMANCE-BASED LOGISTICS

ESG and the Bundeswehr university in Munich on course for innovation

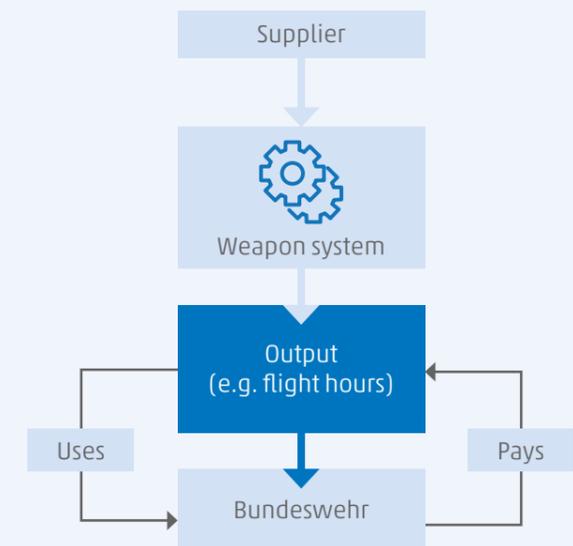
Within the scope of a common research project with the Chair for procurement and supply management of the Bundeswehr university in Munich (UniBWM), ESG are investigating how the future support to the armed forces can be enabled with innovative logistics solutions.



Without performance-based logistics



With performance-based logistics



1 Figure 1

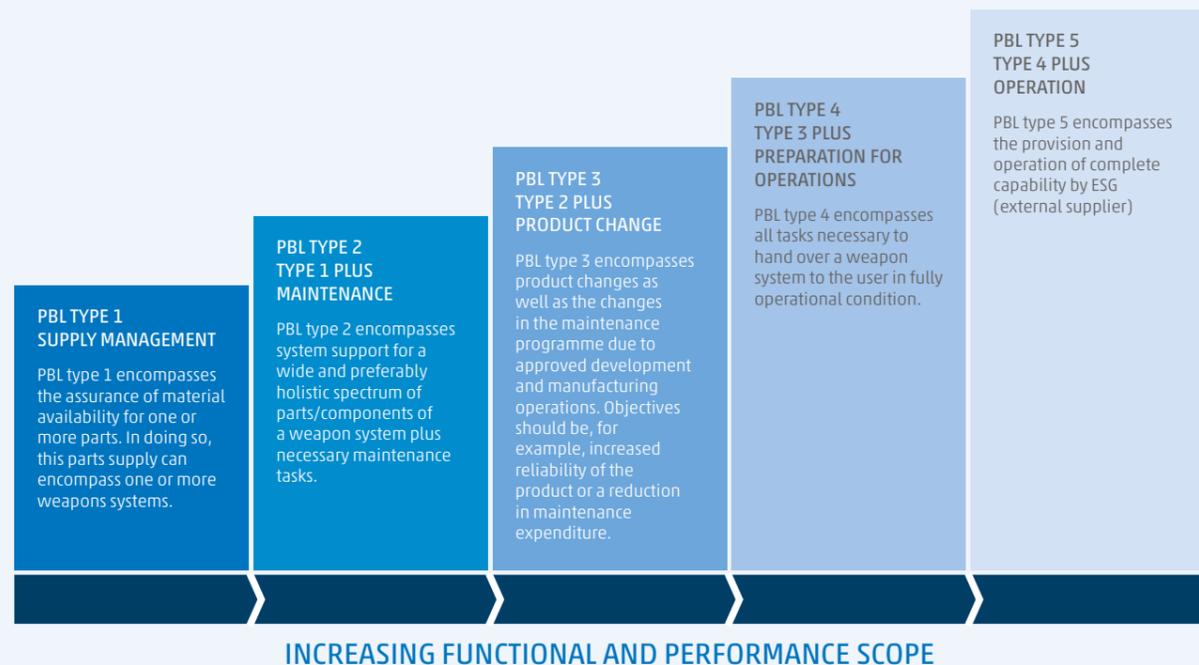
In doing so, the focal point of the cooperation is the Performance-Based Logistics (PBL) approach. With the help of this approach, a significantly better performance should be achieved in the areas of maintenance, repair and logistics in order to optimise the operation of the fleet with regard to availability and operational readiness.

PBL denotes the procurement of products at performance-linked prices. In concrete terms, we always speak of PBL if:

- » logistical elements from the utilisation phase of weapons systems are the contractual content of a performance-based contract, whereby
- » this is always comprehensive system support in selected areas, from individual systems through to the complete fleets,
- » i.e. as many logistics tasks (e.g. transport, stores management, material planning, order-picking, etc., measured by means of key figures) defined as results-based contractual items, which are the responsibility of the supplier,

- » whereby the system support can be implemented starting from individual parts (PBL in a broader sense) through to complete weapons systems (PBL in a stricter sense)
- » and the outcome of the contract always contains the improvement of the reliability, the availability and the performance of the weapons system or its sub-systems and/or parts, as well as to reduce life-cycle costs or at least to keep them stable and therefore predictable ("performance cost").

The starting point for the subject of PBL is the claim of guaranteeing consistent supply for all soldiers and weapons systems of the Bundeswehr. Because the training and deployment of our soldiers can be guaranteed only with available and deployable materials. However, the high level of complexity and in some cases also the (fault-)susceptibility of modern high-performance systems often results in poor availability. Particularly in current times with the continuously changing security situations and stretched defence budgets with the simultaneously rising range of tasks, the development of new and more reliable logistics solutions becomes increasingly important in order to counteract these challenges.



2 Figure 2: Stages model for PBL types

PBL, which was initially developed in the USA around the year 2000, is a promising approach for this, and which has in the meantime also been introduced in the Bundeswehr and has become an element of the military aviation strategy. Initial international empirical values show that PBL can lead to improvements in availability, performance and ultimately also in efficiency, whereby the focus here is always on the performance side ("Performance-based" rather than "Cost-based" logistics).

FOCUS on performance

In order to ensure that improvements are also actually usable for the Bundeswehr, ESG has developed a concept together with the UniBwM to enable logistics services tailored to the Bundeswehr to optimise system management using the PBL approach. To do so, six main work packages (APs) have been developed in a three-year cooperative research project.

The concept developed the provision of services such that the services (ESG: Planning, Support, Maintenance, Repair, Storage) are implemented by means of the performance of the system (Fig. 1).

The Bundeswehr are very interested in innovative logistics concepts. Last but not least, as mentioned in the military aviation strategy for the first time, performance-based services are growing in demand by the Bundeswehr.

The Bundeswehr have already implemented the first pilot projects based on the stage model (see Fig. 2). With the tools of learning, ESG is ideally prepared for this and stands ready as a high-performance and reliable partner for future PBL projects.



TRAINING AND FURTHER DEVELOPMENT FOR HEALTHCARE PROFESSIONALS

ESG presents innovative VR simulation solutions

From the 10th to the 12th October, the 50th congress of the German association for military medicine and military pharmaceuticals (DGWMP) took place in Leipzig. The subject of this year's congress was "The civilian-military cooperation in the healthcare service of the Bundeswehr – learning from one another one and shaping the future together".

Together with VirtaMed, ESG were represented with an expert team at the accompanying industrial exhibition with a trade fair stand and presented innovative, virtual reality based simulation solutions for training doctors and healthcare professionals.

It was possible to hold many, very valuable discussions with high-ranking professional visitors during the course of the congress, leaving a visible positive impression of ESG's performance capability in the field of healthcare too. The Surgeon General of the medical

service, Dr. Ulrich Baumgärtner, visited the ESG stand and showed great interest in the simulation solutions being offered there. Many of the gaps in services could be filled with the portfolio offered by ESG and the Bundeswehr's healthcare service could be expediently supported with concrete projects.

One day before the congress, the DGWMP hosted the 4th "Bundeswehr healthcare service. Further development, procurement and digitalisation" seminar, at which ESG was likewise represented. Within the seminar it was very clear that the healthcare service was currently in a state of flux. Where in previous years efficiency was the focus, in future effectiveness will become increasingly promoted. In his closing address, Dr. Baumgärtner said that he placed great hope in the civilian-military cooperation and invited industry to become more involved in this, whereby he would be met with listening ears and open doors at ESG.

ESG TECHNOLOGY FORUM 2019

Open innovation in the real world

Innovative strength and passion for technologies for user-oriented products and solutions have been characteristic of the employees of the ESG group right from the beginning. One of the highlights in the events calendar for ESG, who have won several awards for their excellent innovation management, is the continuously further developed format for target-oriented dialogue from technology experts and the management team of ESG with acknowledged experts from research and industry regarding promising developments and trends.

- 1 Ferdinand Stocker, Managing Director of the ESG mobility subsidiary ServiceXpert GmbH demonstrated the Truck2park system.
- 2 The Dependable Autonomous Driving Lab of the technical university in Clausthal
- 3 Future discussions with the TUM team Hyperloop: From the SpaceX prototypes towards new mobility concepts

Well over 200 participants at the ESG technology forum were able to delve intensively into innovative technologies that could soon be transferred into concrete products and solutions for their customers, at interesting lectures "from ESG-ers for ESG-ers", inspiring keynotes from renowned scientists, fascinating workshops, stimulating discussion sessions or at end-to-end supervised learning sessions: Autonomous systems in all dimensions; mobility concepts for the future; hybrid-electric flight, VTOL for example, integrated modular avionics systems; data solutions platform, quantum computing, innovations in system integration in the aerospace sector or artificial intelligence were a few of the keywords of the day. The participants seemed to be particularly impressed with the live demonstration from the Clausthal technical university's Dependable Autonomous Driving Labs as well as the presentation of the TUM teams for the Hyperloop project: "From SpaceX prototypes to the mobility of the future".

Prof. Klaus-Robert Müller, from the Berlin TU, Prof. Andreas Rausch, from the Clausthal TU and Prof. Manfred Broy, from the Munich TU, fascinated the public with their excellent keynotes on: "Explainable Artificial Intelligence"; "Connecting Product Management and Software Product Line Architecture – Challenges for the Digital Transformation"; "Requirements Engineering – in contrast to agility? From the role of the requirements for the management of projects."

Alongside the intensive professional exchange and the development of personal networks amongst colleagues, the ESG Engineering Excellence Prize and the ESG Innovation Prize were also awarded, where ESG recognises particularly distinguished service from employees.

"Once again I have been impressed with both the format and also the diversity and high-quality content of the ESG technology forum. In addition, the personal exchange with colleagues that one does not work with every day was particularly valuable", says Dr. Thomas Pfenninger, Technology Coordinator for ESG DEFENCE + PUBLIC SECURITY.

"It is simply great how our internal and external colleagues have contributed to the perfect success of the day through their tireless efforts during the preparation and subsequent implementation of the event.", says Hans-Jürgen Thönnißen-Fries, Head of the Centre of Excellence for Systems Engineering, responsible for the whole organisation of the technology forum. "The technology forum provides an excellent platform to promote scientific exchange within the ESG group as well as to provide specific fresh impetus from outside through the integration of excellent external partners, such as the Berlin TU, the Munich TU or the Clausthal TU." continues Mr Thönnißen-Fries.

"With this format, I believe that we have done more than just reach our goals: Expanding our own innovative strength, receiving new impetuses from the development for concrete project ideas and real added value for our customers and the pleasure of sustainably strengthening our passion for technology and personal cohesion in the team", says Dr. Björn Pötter, Head of Capabilities and CTO of the ESG group.

Prof. Andreas Rausch explains: "The innovation management that ESG has implemented for many years, in fact in the best sense exemplifies them, is to be cherished and forms the central foundation for the company's success – I have thoroughly enjoyed being a part of this once again."





FASTER, CLEARER AND MORE UP-TO-DATE ESG MOBILITY at the BMW Group IT trade fair 2019

Every year the BMW Group invites selected partners and suppliers to the IT trade fair in Munich. ESG MOBILITY brought three innovative topics along.

The objective of this in-house trade fair is to enable BMW AG's own management as well as the various BMW departments a comprehensive and in-depth overview of current projects as well as innovation topics both from the Business IT and the Vehicle IT areas. At the same time the exhibitors take advantage of the opportunity for presenting new ideas, establishing new contacts and deepening personal networks during the numerous guided tours, specialist lectures and in the course of further dialogue forums.

For many years now, the well-proven framework for this has been Munich's Zenith hall, which not least links the traditional art of engineering with the digital agility of future mobility in a unique way through the architecture of this listed building.

In these surroundings, the ESG MOBILITY team presented three innovative topics from the fields of Diagnostics, Software Development and Backend IT:

MiDiS

Motorsport intelligent Diagnosis System

MiDiS enables racing team support in a completely new dimension: Previous tools required around 12 minutes for the vehicle identification and basic diagnostics. MiDiS manages this in just 10 seconds thus delivering a crucial time advantage in racing. Furthermore, the system also impresses with its rapid development time and modular construction.

DevOps COCKPIT

Development progress at a glance

The DevOps Cockpit is a web-based tool that uses historical data to calculate fully up-to-date Key Performance Indicators. The resolution rate of tickets or the proportion of successfully implemented deployments will be analysed for example. Whether the complete order development or the acceptance of individual work packages – the ESG DevOps Cockpit also illustrates the complete process depending on the specific requirement.

MDR BACKEND

Cloud-based data visualisation of the test fleet

Concrete search orders or analysis tasks are sent to the MDR (Mobile Data Recorder) and carried out locally in the vehicle. Only the results are fed back to the Backend. The vehicle management (vehicle characteristics, Live-Map, MDR-Lifecycle) is illustrated here. The presentation of the MDR live data from the test vehicles in the Backend is implemented by means of Kusto in the Azure Cloud ADX.

KI@AUTOMOTIVE

Application fields for artificial intelligence aside from autonomous vehicles

ESG MOBILITY colleague Dr. Daniel Isemann impressed the specialist audience with his lecture. Based on the diverse practical experience and domain knowledge of ESG MOBILITY, he examined whether or rather which roles artificial intelligence can play in non-autonomous vehicles or outside the vehicle, e.g. in development processes. In doing so, he also considered the aspect that AI is increasingly being seen as an economic growth factor.

INTELLIGENT CHARGING OF ELECTRIC CARS

ESG MOBILITY thinks "on demand"

The future power demand of e-mobility would overload the current electrical grid. Looking ahead, ESG MOBILITY is already working on a solution that will save Germany billions of euros of investment.

In the meantime, the fact that e-mobility is no longer an illusion but rather is a model for the future, is already generally acknowledged. However, many are still shy of changing over as the thought of the continuous search for a charging station or tedious fiddling with charge cables is unattractive for the consumer and acts as a deterrent for many. Also for this reason, inductive, so contactless, charging is very high on the to-do list of many manufacturers. But, beyond this particular issue, there are also significant far-reaching consequences arising through the positive development of e-mobility – not only for the consumer but also for the whole state.

E-MOBILITY REPRESENTS A HUGE CHALLENGE FOR THE ELECTRICAL GRID

In fact, by 2035 every third car on German roads will be electrically powered – in some cases also thanks to convenient inductive charging. And this presents a huge challenge for the electrical power supply as the German grid is not currently designed for this quantity of electrical vehicles. In the current condition, this could result in widespread power cuts if more than 30% of vehicles are electric. Supply bottlenecks will arise in some places as early as in the coming five to

ten years, perhaps in urban areas with a higher affinity for electro-mobility.¹ A corresponding expansion of the grid represents billions of euros of investment.

RESEARCH PROJECT "FEEDBAC CAR" – IS THAT THE SOLUTION?

ESG MOBILITY identified the dilemma between power demand and power supply early on and set out to find a timely resolution for this. Together with the federal government, vehicle manufacturers, grid operators, research facilities and service providers in the "FEEDBAC CAR" research project, work is already being done to develop a concrete solution: An intelligent charging management system for e-vehicles.

This intelligent charging technology will not only stabilise the electric grid readying it for e-mobility, but will also establish the energy management of tomorrow.

The intelligence of the system lies in the scheduling and control of an inductive charge process. The basis is the inductive transfer of electrical energy – both from the supply grid to the vehicle and also from the vehicle back to the supplier.

1 ESG MOBILITY: Viable concepts and innovations for intelligent charging

Image: Zollner Elektronik AG



THEORY VS. PRACTICE – JUST EMPTY WORDS OR REALLY VIABLE?

In theory it sounds very simple, but is the handling also so simple? Definitely, yes!

The vehicle's owner selects their departure time and the desired quantity of energy with which the vehicle should be charged. The intelligent charge function of the vehicle then uses this information to control the timing of the charging and to select the most cost-effective tariff. The system checks the compliance with the required quantity of energy automatically.

The benefits for the owner of the vehicle are obvious: Night tariffs are used to charge the vehicle inexpensively. In the event of high electrical energy prices, energy is fed back into the grid. So, not only the energy that was previously drawn from the grid can be managed to provide a profit, but the energy created by the owner themselves, for example from a photovoltaic system on the house roof, can also be fed back into the municipal grid to provide a profit. One's own vehicle

SIMPLE HANDLING?
Definitely, yes!

can thus become a mobile energy store and energy can even be effortlessly fed back into the owner's home from the electric vehicle (Vehicle-2-Home).

INTELLIGENT CHARGING – A WIN-WIN SITUATION FOR EVERYONE INVOLVED

So, if the intelligent charging of e-vehicles is established over a large area, the cost-intensive expansion of the grid could become entirely superfluous. Mains grid operators could better plan and regulate load peaks in the network for the charging processes of electric vehicles. With an unstable grid, electric vehicles with inductive charging technology could be used to stabilise the mains grid.

ESG MOBILITY are utilising their skills in the areas of e-mobility, charge technologies and also Vehicle-2-Home/Vehicle-2-Grid to carry this future-oriented project forward and successfully implement it.

ESG MOBILITY AND VECTOR

Cooperation for controllable electrical/electronic systems



The Munich IT and electronics experts and the Stuttgart software house will be working together in the future in order to make the increasing complexity of current electrical/electronic systems in the mobility sector manageable.

New vehicles and mobility concepts require very powerful electrical/electronic systems. The "e/e" architecture is the connecting element and is responsible for realising the successful networking of the vehicles and the software-based customer functions. In view of the large number of new mobility platforms with different vehicle variants, drive systems and individual customer features it is no surprise that the market for the development of these e/e architectures is currently growing rapidly. Experts expect that the global volume will have increased by more than 50% by 2021.

The Munich IT and electronics experts ESG MOBILITY are now working closely with the "Process Tools" division of the Stuttgart software house Vector Informatik, in

order to service the growing market and to master the associated challenges in the complexity of many vehicle developments.

Vector's own e/e architecture and e/e serial development tool PREEvision provides a significant contribution for the technical implementation of current e/e systems since all development steps can be coherently illustrated in one tool and the associated data can be consistently saved in a backbone. The associated services and the expertise for the implementation of challenging e/e projects and the e/e complete vehicle development will be provided by ESG MOBILITY.

Both the established vehicle manufacturers and the new players in the field of mobility should be approached jointly. A cross-industry approach is also planned. Vehicle manufacturers, who drive ambitious digitalisation offensives and who must integrate a high number of new mobility features in order to withstand the competitive pressure, will also be addressed. "From our perspective, the cooperation with Vector represents an ideal combination of an excellent tool and an experienced team, in order to develop cost-optimised and robust e/e systems, for example with automotive Ethernet and service-oriented architectures (SOA). With this we can offer a sustainable and functional basis for the digitalisation of mobility", says the e/e complete vehicle expert from ESG MOBILITY, Fran Candal.

YOU CAN FIND MORE DETAILED INFORMATION ON PREEVISION IN THE INTERNET AT www.vector.com/PREEvision

FOUNDATION STONE FOR THE NEXT CENTRE OF COMPETENCE

ESG MOBILITY opens a branch office in Fulda

GRAND OPENING

In September, ESG MOBILITY opened their new site in Fulda. The responsibility for the story there has been taken on by Jens Schmidt, who will head up the branch office in Fulda.

The Fulda site is very interesting from an infrastructure perspective as it is close to colleges and universities, for example Kassel University or the Mittelhessen University of Applied Sciences. As a dynamic business location, Fulda is also attractive to specialists and their families thanks to its high quality of life.

SURROUNDED by colleges and universities

With their new branch office, ESG MOBILITY are pursuing the goal of becoming the most attractive engineering partner in the region. By 2025, the Fulda site should develop into a leading centre of competence for embedded software development, specialising in the subjects of consulting, service-oriented software development and the development of software products and services.

INCIDENT DETECTION & RESPONSE

How to avoid the three most common errors

Detecting cyber attacks quickly and reacting with appropriate measures is more important now than ever. Technology alone is not enough for this. Having an experienced Incident Detection & Response team (IDR) and suitable processes is critical. Practice has shown: Even with complex attack scenarios there is still a substantial need for optimisation. Here are the three most common IDR errors – and how you can avoid them.



Almost every second German company has been a victim of cyber attack in the last two years, according to a current Kaspersky study. The threat level is increasing. Because the target area increases with increasing digitalisation, whilst hackers are developing ever more advanced methods of attack. Even with the best technology, it is never possible to rule out the risk of cyber attack completely. It is ever more important to detect a successful attack as quickly as possible and to introduce the correct measures in order to minimise damage. Even if just one week has passed, in most cases the costs will have more than doubled in comparison to timely detection.

Most companies are aware of this urgency. For this reason some of them have a well set up Incident Detection & Response team and are working with SIEM systems that assess log files and sound the alarm if they discover signs of a security incident. But in reality, practice has shown: As soon as they are faced with complex attack scenarios, IDR teams and processes are often at their limits. We have distilled the ten most common IDR errors from the training, which CYOSS has held since 2017. We would like to present the top three to you here.

1 THE ABILITY TO SEE THE BIG PICTURE IS MISSING

If security tools sound the alarm, the IDR team must examine the Indicators of Compromise (IOC) and analyse the technical details. Now it is necessary to find out what has happened, which systems have been compromised by the attacker and what they plan to do next, as quickly as possible. Most often, the individual analysts collect a wealth of information for this. The problem with this is: Everyone is working for themselves. There is no one who has a complete overview and can assemble the individual pieces of the puzzle together into an overall picture. But it is exactly this that is critical to understanding complex attacks and to detect patterns.

Tip
Establish the central role of an Incident Manager. They coordinate the individual analysts and ensure that all of the information is brought together. This way it is possible to create a connection between the individual IOCs, detect patterns and form an overall impression. The Incident Manager also has the task of developing an awareness for the 'big picture' in the team members.

2 NO ONE SPEAKS TO ANYONE ELSE

Intrusion Detection & Response is a team task. Only if the individual analysts exchange their information and communicate with one another it is possible to get a cyber attack under control quickly. The less well the team members know each other, the less they generally talk to each other. But even in experienced teams, well-proven communications structures often break down during serious events. Because, in stressful situations each person is so focussed on their own work that they forget to share their knowledge with the others. This allows valuable information to slip through the gaps.

Tip
Carry out training for communication in stressful situations and establish methods for the most efficient exchange of information in the team. This could be via a collaboration tool, a flip-chart or a mindmap, for example. So communications structures that also work during serious incidents can be established. In addition, it is also advisable to change the roles in the team from time to time. Then the individual members learn their colleagues' tasks better and can communicate better with one another.

3 STANDARD PROCESSES FAIL

Most companies have established standard processes for situations such as an attack on a web server or a virus infection on a client. These are documented in so-called playbooks, which regulate the steps to be followed in sequence. So long as just a few systems are affected or a singular event occurs, playbooks function well. However, in the event of more complex attack scenarios, they hinder a rapid reaction. Because suddenly the IDR team must deploy five playbook processes simultaneously. This causes chaos and often results in information no longer being correctly documented and thus to the loss of the big picture.

— Tip —

Do not cling desperately to the playbook processes in stressful situations, but rather make it as simple as possible to exchange information and react quickly. In the event of a complex incident it is advisable to call all team members together every hour for a ten minute meeting. Create a situation report together and update this at regular intervals on the whiteboard.

SUMMARY: COMMUNICATIONS AND ORGANISATION AS MAJOR WEAKNESSES

In most cases it is only once there is a serious incident that one discovers how well the IDR teams and processes really work. For this reason, regular training is important in order to try out complex attack scenarios and to establish best practices. In addition, the IDR team must continuously develop to ensure that they are armed against the growing threat levels. Because, experience has shown that the greatest IDR weaknesses are generally in the communications and organisation. Alongside the top three mentioned here, there are many other errors that should be avoided. You can find the complete top ten list in our white paper.

YOU CAN FIND THE COMPLETE TOP TEN LIST IN OUR WHITE PAPER.



<https://cyoss.com/de/publikationen/whitepaper-top10-blue-team-fails>

IDR TRAINING

CYOSS has carried out specialised training courses and instruction sessions for IDR teams at regular intervals since 2017. In the Cyber Simulation Center, which is based on state-of-the-art simulation technology, companies can try out serious incidents and can train for realistic, current attack scenarios without any risk. You can find further information at cyoss.com

"DES MACH MA!" [WE CAN DO THAT!] CYOSS at the 3rd Action Day for Munich companies



The Munich companies' Action Day offers companies an opportunity to increase awareness and get involved with social and ecological work. Through their vigorous support employees take the strain off non-profit organisations and gain new inspiration and impetus for the own work at the same time. The goal is to create concrete added value for the common good of the city through shared activities, craft tasks, garden work or excursions.

The team from CYOSS was also involved in May in the 3rd Action Day for Munich companies. For one day, laptops and telephones are exchanged for hammers, brushes and garden utensils - and instead of customer appointments, concepts and codes, work was industriously carried out on a project in the fresh air. The CYOSS team supported the community centre for integrated housing (IWO) in the Nymphenburg district of Munich, with great energy.

The Munich city model project with sponsorship from 'Hilfe im Alter GmbH' [help in old age] of the Inner Mission of Munich provides assisted residences for elderly people, where the residents live together in a neighbourly environment and share a garden courtyard. And exactly this courtyard was the focus of the project day: Some repair work and gardening work was due to get the common area ready for the summer.

In coordinated team work between IT experts and business people, a new wooden cabin for storing garden tools was built and painted. Of course great

care was paid to security and so our cyber security experts felt right at home. The data analytics specialists enjoyed tackling tangible objects for a change and giving the garden furniture a thorough "Makeover". In addition, the team dedicated themselves with great skill to the task of repairing and planting a raised bed.

Some of the residents of the senior citizens' facility passed by during the day to marvel at the work and to thank the team for their industrious support. Many got stuck in too and helped with the planting. The team were able to gain a better insight into the life of the senior citizens during a common lunch.

Our team seemed very happy at the end of the day. Senior Data Scientist Christoph recounts: "This social project day gave me a change of perspective that would not always be possible in my daily work. It was a rewarding experience that gave me a new insight into the life of older people. From now on I will certainly have a completely different awareness of this."

THE TEAM SPIRIT COUNTS

Company fun run 2019

More and more companies are becoming actively involved with their employees in company fun runs. In doing so, it is not only the workplace health that is promoted but also the team spirit and well-being.

The ESG group has already taken part in three company fun runs this year. The ESG MOBILITY team, comprising five runners, were on the starting line on the 06.06.2019 in Wolfsburg showing great sporting commitment. All of the colleagues successfully bested the 5.1 kilometre course around the Wakepark and the Allersee lake. A varied entertainment programme awaited them at the finish line, providing a great mood and a relaxed atmosphere after the run.

In Koblenz too, the ESG IOS from Weißenthurm were there to provide great support to their ESG colleagues from the Koblenz site on the 28.06.2019 at the annual Münz company fun run. The ESG runners were on the starting line showing great sporting commitment and enjoying themselves in the bright sunshine. A reprise is already planned for 2020.

The highly motivated CYOSS team were there at the start of the Munich B2Run on the 16.07.2019. The 6.1 kilometre course ran through the green Olympia park past the numerous spectators who enthusiastically cheered on the 30,000 participants from around 1500 companies. For the CYOSS team, running together as a small team in the middle of so many participants was an unforgettable experience. The mood was great as the CYOSS runners crossed the finish line in the Olympia stadium before enjoying a well-deserved refreshment.

We are delighted with the number of participants from our ranks and congratulate this year's runners on their personal successes at the company fun runs.



THE GERMAN SCHOLARSHIP AT ESG

Scholarship student Magdalena Fuchs' experiences

In 2019 too, ESG was once again committed to the sponsorship of the German scholarship project in order to support the specialists of tomorrow.

The German scholarship is the largest public-private joint venture in the training sector with more than 7000 sponsors. In doing so, motivated young people are not only financially supported but also have the opportunity to develop themselves further both professionally and personally through the additional close cooperation with employees of the sponsoring companies.

Our previous scholarship students were not only grateful for the financial support of the German scholarship but were also delighted with the amalgamation of many motivated and committed people. "For me, this very commitment and the many joint activities under the motto of 'Donate talent' distinguish the German scholarship. For this reason I think it is good that 'soft factors' such as background and family situations or personal social commitment in particular are taken into account alongside the formal criteria of grades, for the selection of the students for the German scholarship. This in itself is a wonderful opportunity that has been given to the scholarship students. I was really glad that ESG was a sponsor of this scholarship and that I was able to take part in this programme."

Since 2013, we have been passing on a share of our corporate success to the next generations and helping committed and talented students with their professional and personal development. German scholarship students are not only amongst the best in their profession but are also special personalities too.

SCHOLARSHIP
with more than
7000 sponsors

So, in the end, everyone benefits – both the participants on the students' side and us as a company too. With the German scholarship, we also want to specifically encourage young women in the still very much male-dominated IT sector, both financially and

also through integration into the concrete everyday operation of the company. For this reason ESG is awarding not just one but three scholarships this year.



