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Federal Office of Bundeswehr Equipment, Information Technology and In-Service Support

The Organisational Area of Equipment, Information Technology and In-Service Support - in German abbreviated "AIN" - is the sector of the Federal Defence Administration that is responsible for satisfying the armed forces' requirements in terms of materiel and for managing the in-service use of fielded materiel with the aim of maintaining the operational maturity of that materiel.

Partner of the Armed Forces

The Organisational Area just mentioned is made up of the Federal Office of Bundeswehr Equipment, Information Technology and In-Service Support (BAAINBw) and its subordinate agencies comprising six Bundeswehr Technical Centres, two Bundeswehr Research Institutes, the Naval Arsenal and the German Liaison Office for Materiel in the USA and Canada. It supports the armed forces as a reliable partner. Ensuring that the Bundeswehr is supplied with state-of-the-art technology/equipment and defence-related services, in line with what the armed forces need and reguest and under favourable cost-efficiency conditions, is a demanding task. Although sometimes commercially available equipment may be used, it is in many cases necessary to initiate the development or advancement of specific military materiel. This is why the procurement of complex materiel takes time: time to develop the necessary technical solutions, prepare the contracts for such development and conduct the related tests. Not every idea from the development phase passes the practical trials at the first go. It is of vital importance that realistic timescales are selected. And: the management of the armament projects has to be shaped in such a way as to create maximum efficiency.

Responsibility for the Entire Life Cycle

BAAINBw was set up on 1 October 2012 in the framework of the restructuring measures in the context of the Reorientation of the Bundeswehr. Meanwhile, it can look back on a five-year history. Before the foundation of BAAINBw, the responsibility of the civilian Bundeswehr procurement organisation with respect to military materiel was limited to technological and economic the procurement and in-service support process in order to implement this integrative approach. And this is the essence of the BAAINBw approach.

By taking over the materiel responsibility for operational maturity, BAAINBW has shouldered a new task that, in this integrative way, had so far been practiced only by the Bundeswehr IT Office to a limited extent. In line with this approach, implications of the creation of BAAINBw were not only that the former Federal Office of Defense Technology and Procurement (BWB) and the former Federal Office of the Bundeswehr for Information Management



The BAAINBw is located in Koblenz.

support from the moment the respective materiel was handed over to the user. The new organisation, which uses a modified procurement procedure called amended Customer Product Management, is based on a comprehensive view of the entire life cycle of products (or services) and life-cycle-related support management – this is commonly referred to as materiel responsibility for operational maturity.

Such a comprehensive view required a profound change of thinking with respect to and Information Technology (Bundeswehr IT Office) were merged but also that elements of other Bundeswehr offices which had been in charge of in-service support management tasks were integrated into this new Federal Office.

As a consequence, specialists who had performed in-service support management tasks in the various armed forces offices were transferred to BAAINBW. Thus, the procurement expertise available in the above-mentioned two former offices of the armaments sector was complemented in an effective fashion. This transfer of proficiency and know-how made it possible for BAAINBw to take over its comprehensive tasks of materiel responsibility for operational maturity - ranging from the analysis phase to the time of disposal - on a sound basis of competence.

Armaments Agenda

Under the objective of optimising the management of armaments projects and further enhancing efficiency, State Secretary Dr. Katrin Suder initiated the Armaments Agenda on 7 October 2014. This agenda shows the way, so to speak, towards a more transparent, more effective and more modern armaments organisation.

The consequences of the Armaments Agenda include organisational changes within BAAINBw and its area of responsibility. This "moderate readjustment" is the result of the findings and the experience of recent years and aims at operationally strengthening the Federal Office.

Concepts for the organisational measures were developed from early 2016 onwards and their implementation has been pursued step by step since then. The following measures have been completed by 2017: The first step was the creation of a Program Organization (PMO) at directorate level with effect from 1 April 2016 in order to ensure a largely independent performance of all project management tasks for the three armaments projects MKS 180, TLVS und EUROPEAN MALE RPAS.

The measures to strengthen the project and product portfolio of BAAINBw in a lasting way also cover the so-called Complex Services and the Bundeswehr Purchasing sector. To this end, the Complex Services/ Purchasing Directorate was created with effect from 1 July 2016, which formed the second step in the sequence of measures. The next measure was the creation of a new element called Operational Management Staff, Executive Secretary of BAA-INBw, which performs steering functions within close reach of the Executive Group. The Technical Quality Management Center was set up on 1 April 2017 for the purpose of enhancing technical quality management and quality assurance. At the same time, legal expertise in the form of a Legal Affairs Staff was placed at the immediate disposal of the Executive Group.

The latest measures for the time being have been the creation of the Central Affairs Directorate (1 July 2017) and the Common Technical, Logistic and Economic Activities Directorate, accompanied by the disbandment of the P, Q and Z Directorates. The final complex of organisational measures will be an optimisation of the three IT Directorates I, G and H, which is currently in the phase of preparatory planning.

Operational Management Staff

The Operational Management Staff comprises four divisions plus the AIN Press and Information Center (PIZ AIN). It is headed by an Executive Secretary and structured as follows for its various tasks:

Division OS 1 is in charge of central task management at BAAINBw level and coordinates all tasks related to Parliamentary/ Cabinet affairs and German Audit Office affairs. It is also the POC for all internal auditing affairs.

All Cabinet and Parliamentary inquiries (e.g. major and minor interpellations, petitions,

regarding the BAAINBw activities in the sectors of projects, products and services. In practical terms, this is where the BAA-INBw productive process is initiated.

Once the Integrated Planning Process (IPP) has been completed, the Bundeswehr Office for Defence Planning draws up a capability situation picture and derives capability gaps from that. If these gaps are planned to be closed by means of material solutions or Defence-related services. Division OS 2 will trigger the work on initiatives, making use of the technological and economic competence of BAAINBw. This will include coordination of the involvement of the respective BAAINBw Authorised Representatives in the Analysis Phase Part I of the amended CPM. Division OS 2 thus supports the Bundeswehr Office for Defence Planning right from the start of the procurement process in determining the key data of a project



The "Rheinliegenschaft" compound of BAAINBw

correspondence with the Parliamentary Commissioner for the Armed Forces) are handled here in cooperation with the respective competent elements within BAA-INBw and its area of responsibility. Division OS 1 also prepares visits of Members of Parliament to BAAINBw and its agencies. This division furthermore compiles the information and documents which the BAAINBw Executive Group needs for participation in Defence and Budget Committee meetings. With respect to German Audit Office affairs, OS 1 has the primary responsibility for handling all incoming matters concerning planned auditing activities of the German Audit Office and the regional audit offices. The tasks of Division OS 2 include coordination of the cooperation with the Bundeswehr Office for Defence Planning, status surveys and portfolio management across the overall period of its existence (from creation to service use) and feeding these data into the decision-making process - a fundamental contribution to portfolio management in the Bundeswehr. In the framework of portfolio management, OS 2 aims at achieving a continuous survey of the status of current and emerging projects, products and services including their interfaces and interdependencies. To this end, the division compiles the information available on projects, products and services in all BAAINBw directorates to draw up a situation picture. Depending on the objective and concrete problem, a relevant selection of projects, products and services is gathered in a sub-portfolio. The latter is analysed and alternative courses of action are generated, which are then harmonised with the Bundeswehr Office



The main building of BAAINBw is located in the Rauental district of Koblenz.

for Defence Planning and/or other organisational entities or requesting entities involved, before they are implemented on the basis of the decisions that may have to be taken.

Finally, OS 2 is the section that has the function of a central element within BAAINBw for portfolio management at the project/ product/service level. In this context, the newly established Project Steering Group of both the Bundeswehr Office for Defence Planning and BAAINBw is of importance, which is designed to ensure maximum transparency and smooth progress of the projects in all phases. This Steering Group acts comprehensively above the level of the single projects, using a common basis of information.

Division OS3 is in charge of Central Controlling at BAAINBw, which means controlling across directorate and agency boundaries. In this function, the division performs tasks of strategic controlling, project controlling, controlling of complex services, controlling of resources and agency-related controlling. It furthermore draws up the annual report in the framework of the so-called Accompanying Performance Review with respect to the work of government-owned companies for the Bundeswehr. In an advisory function, OS 3 ensures the uniform application of the controlling procedures in the directorates and agencies.

On behalf of the BAAINBw Executive Group, the division performs superior-level project controlling in the form of eventrelated analyses and assessments regarding the progress of BAAINBw armaments projects and complex services. This is done on the basis of IT-supported project documentation, which includes the systematic identification and assessment of the project-related risks. As regards the standing preparatory committees for the Armaments Board at the State Secretary level, the project-specific inputs to be provided by BAAINBw for the Armaments Board at the Minister of Defence level and the biannual Armaments Report to the Parliament. Division OS 2 performs a coordinating function. Likewise, risk management at the level of the Director-General for Equipment in the FMoD is supported through coordinating work. On a regular basis, the division provides the Executive Group of BAAINBw with assessments on the achievement of quality gates by the projects and on proposed solutions for the realisation of new projects. It closely cooperates with the Project Controlling and Risk Management Division, which has been established in the FMoD as a body supporting the Commissioner for the Strategic Control of National and International Armaments Activities of the Bundeswehr.

The aim of Division OS 3 is to extend the risk management method to CatC projects and, at a later time, also to CATD projects. This requires intensive involvement in the training of the personnel working in the projects concerned.

BAAINBw strategic controlling supports the BAAINBw Executive Group's management process, which is directed toward mediumterm and long-term objectives. In addition, the decentralised controlling envisaged for the future (i.e. extending FMoD strategic controlling to the subordinate levels) will probably imply that, firstly, objectives of the FMoD strategic system of objectives will be derived, cascaded down and operation-



Organizational chart: Operational Management Staff, Executive Secretary of BAAINBw

alised and that, secondly, agreements on objectives will be established in order to create the prerequisites for consistent topdown control. Additionally, OS 3 supports the BAAINBW Executive Group in drafting and monitoring compliance with the Annual Directive, which contains the strategically relevant objectives of the Federal Office.

The tasks of Division OS 4 are as follows: standardisation and advancement of management methods for projects, products and services, including rules on requirement engineering and the Prioritised Requirements Catalogue; policy matters related to the amended CPM, including **Output Process Management and policies** on BAAINBw quality management; active practice-oriented training of and advice to project personnel; quality assurance regarding all these procedures/methods; control of the services provided under framework agreements on project management support. In the context of the BAAINBw Knowledge Management concept, the focus is on shaping the knowledge cycle of the BAAINBw personnel in a more effective and efficient way. This includes the responsibility for creating the necessary framework conditions. At the same time, specialist assistance is provided to the introduction of technical collaboration and document management environments.

The Equipment, Information Technology, In-Service Support Press and Information Center (AIN Press and Information Center), as part of the Operational Management Staff, is responsible for all internal and external communication of the AIN Organisational Area, forming an element of the Bundeswehr Information Activities concept. The AIN Press and Information Center acts as primary BAAINBw point of contact for questions that are raised by either media representatives or citizens and that concern the scope of AIN tasks. The task of Press Relations include, among others, active information of the media on matters of interest, daily evaluation of press reports and drawing up articles for various specialist journals in cooperation with the respective BAAINBw experts. In the field of Public Relations, the AIN Press and Information Center is responsible for, firstly, participation of BAAINBw in events that are important for visibility and external image and, secondly, the production of multi-media information material. The online editorial board of the AIN Press and Information Center maintains the BAAINBw intranet and internet websites and provides conceptual inputs to the online work of the AIN Organisational Area.

PMO – Program Organization

In the fall of 2015, Federal Minister of Defence Dr. Ursula von der Leyen announced during the budget debate in the German Bundestag that three new large-scale armaments projects would be managed within BAAINBw but with their own structure and personnel. In this way, legal, technical and economic experts would be permanently assigned to their respective projects.

"One size DOES NOT fit all" - regarding the domain of organisation and processes, this was the key lesson learned that led to this transformation. On the basis of the "Comprehensive survey and risk analysis of major armaments projects" from 2014, a comprehensive modernisation of armaments procurement, known as the Armaments Agenda, was initiated. With this road map, a successful turnaround in terms of equipment has been achieved. The purpose of the approved modernisation is to improve standardisation of procedures and to enable uniform structures to increase transparency and management capacity. Moreover, it will make it easier to take the differences and particularities of specific armaments projects into account. After all, procedures tailored to the procurement of clothing are not necessarily suited to aircraft or similar large-scale projects.

In April 2016 the Program Organization (PMO) was established at BAAINBw at directorate level. It integrates the three key armaments projects that were newly set up during this legislative period: the MKS180 multi-role combat ship, the tactical air defence system (TLVS) and the study on the multinational preparation of the development of the European MALE RPAS¹. In this way it will be possible to perform all tasks related to project and contract management in a centralised and largely independent manner. BAAINBw directorates "Sea", "Combat" and "Air", which had been in charge of the projects, transferred their responsibilities to the PMO, once it had established its operational capability. The PMO responds to these projects' need for a centralised and largely independent organisation, where management tasks are performed on a flat hierarchy basis, by having specialists from various fields cooperate with a direct focus on the projects. Efficiency gains and effective project management are achieved thanks to the close information exchange resulting from the consolidation and the optimised coordination of technical, commercial and legal aspects. The in-house company "BwConsulting" provides valuable support by consulting external experts and establishing state-ofthe-art project management methods in the PMO.

The PMO is organised into four groups and a staff. Three groups (PMO1, 2, 3) are responsible for the projects. A fourth group (PMOJ), which incorporates the PMO's legal and economic expertise, is led by the projects legal advisor. Each of these experts is permanently assigned to a particular project. The PMO currently has a total number of 109 posts, 13 of which belong to PMOJ. Filling these posts continues to be well on its way, so that the reliable functioning of the three projects can be ensured.

The position of the head of PMO corresponds to that of a BAAINBw director, including the pertinent executive functions. He is in charge of providing an overview of the current situation of each project and he is a member of the project-related steering bodies at the Federal Ministry of Defence (FMOD).

The projects legal advisor is not only responsible for the timely and proper legal management of the projects, he is also the permanent representative to PMO.

Another important element of the PMO is the internal transfer of functional supervision within the FMOD from the Directorate-General for Equipment to the "Functional supervision of selected armaments projects" group (Grp FA RüProj) which reports directly to the State Secretary for armaments at the FMOD. The head of PMO has direct access to the State Secretary for armaments. In this way the flat hierarchy and direct channel of communication are continuously provided up to the FMOD executive group.

Quite irrespective of this, the PMO is an integral part of BAAINBw and its expertise in policy and general matters continues to be required for project and contract management.

The establishment of this new organisation has provided the foundations for modern armaments management methods to be

¹ European Medium Altitude Long Endurance Remotely Piloted Aerial System



PMO Organizational Chart

implemented in the three projects. The aim is to use the experience gathered during the past few years in national and multinational armaments projects to optimise these three projects and to prototypically apply the key elements of the Armaments Agenda.

PMO1 – MKS 180 Multi-Role Combat Ship

As the future modular maritime capability platform, the MKS 180 is to help maintain and complete the capabilities required in the maritime engagement network within the German Navy's entire range of missions and tasks. This includes defence against air attacks as well as surface and underwater warfare. In addition, the MKS 180 ships will be capable of conducting sea-based operations, including command and control of special forces, and performing support functions such as fire support, maritime interdiction and medical support. This mission spectrum will preserve the capabilities of the Class 122 and 123 frigates.

Intense serviceability of the MKS 180 ships of up to two years on deployment and a significant reduction in crew size compared with units in service is intended. To this end, the MKS 180 project builds on the existing concepts of the Class 125 frigate. A contract for four units is planned to be concluded, with an option for another two ships.

One special feature of the MKS 180 project is the award procedure that was selected. For the first time, a maritime

procurement project of this size was put out to European tender. The procedure is designed in such a way that it allows an intensive exchange between the customer and the bidder to improve the content, e.g. the statement of work and the contract on the construction of the ship. The contract award documents place special importance on the processes to be installed at the bidder's and his subcontractors' organisations. These processes refer in particular to effective project management, which focuses on risk management jointly implemented by the bidder and the customer. Another important process is the consistent application of life cycle cost (LCC) estimates when selecting specific components in order to minimize in-service costs from the beginning.

The evaluation of the tenders of the first bidding round underlined the suitability of the approach chosen for the MKS 180 procurement project. The strengthened position of the contracting authority allows negotiations and cooperation to take place on an equal footing. At the same time it becomes evident that the contract award procedure in this dimension is an "exceptional" challenge for all parties involved. In the course of the upcoming bidding and negotiation phase it will be important to carry on the process together with industry on the basis of the experience gained in the negotiations until acceptable bids are submitted.

PMO1 has a total of 32 posts at its disposal to meet this challenge, complemented

by permanently assigned legal experts from PMOJ. The MKS 180 project director makes use of a structure within PMO1 that is based on the following task areas: platform systems, employment system, establishment of operational readiness and common project tasks.

PMO1 aims at selecting an effective weapon system, which is efficient throughout its life cycle, and implementing it together with an active and competent partner by means of a low-risk procurement process.

PMO2 – Tactical Air Defence System (TLVS)

A comprehensive stocktaking formally concluded the tri-national MEADS programme in 2014. One year later, action was started to discontinue the NATO MEADS Management Agency (NAMEADSMA) and the international development contract. The results of almost ten years of development, with a total value of around USD 4 billion, are available to the participating nations, USA, Germany and Italy, for follow-on activities.

A capability gap in ground-based air defence will arise in the middle of the next decade. To close this gap, the Chief of Defence decided on 8 June 2015, in close coordination with the competent FMOD directorates-general, in favour of a MEADS-based solution for a future tactical air defence system. In the wake of this selection decision, the Chief of Defence imposed obligations on BAAINBw to examine the development risks regarding the implementation of the TLVS project, which were identified in the proposed solution, early enough to leave the door open for an opt-out in case of problems with technical feasibility, provided there is an acceptable cost benefit ratio.

The foreseeable high complexity of the future ground-based air defence system, which has a large number of different subcomponents, also calls for innovative approaches within the organisation of the contracting authority. At a very early stage it became clear that the team that had worked on the "old" MEADS project would not be large enough to accomplish the upcoming tasks of the TLVS project in light of its scope and structure, not least because, unlike the MEADS programme, the national TLVS project does not involve a comparable agency such as NAMEADSMA.

Most of the resources for the TLVS project team (PMO2) come from the Combat Directorate, from NAMEADSMA and through the establishment of modern project management methods and posts required for them. A total of 48 posts are allocated to the TLVS project, complemented by the permanently assigned legal experts from PMOJ.

The following four major specialist technical areas were set up:

- Effectors and sensors
- CCI and weapons control systems
- Communication system
- Integration management and compliance demonstration
- In addition, overall responsibility for technical implementation, system safety and overall integration was transferred to a TLVS system engineer, who is the hub of the TLVS architecture and acts as a connecting link and coordinator between the technical areas mentioned above.
- An analogous approach was taken in the field of project management, resulting in the establishment of the following areas:
- Logistics and establishment of operational readiness
- Quality and schedule management
- Budget planning, reporting and risk management
- Configuration and obsolescence management

PMO3 – European MALE RPAS

Since 5 September 2016 Germany, France, Italy and Spain have been conducting a definition study for the development of a European drone. Germany has taken a leading role in this European project for an armed MALE class reconnaissance drone, which is to be designed to carry modular payload. The definition study initially focuses on the multinational coordination of requirements for the system to be developed. Later on, a system design in accordance with national requirements will have to be agreed.

Unlike in previous multinational development projects, the participating nations wish to agree on the development of a drone that will be certified according to common standards, but still at national level. The drone is to have only one configuration, which is to be used by all nations. Nevertheless, individual national requirements can be met, because the payloads will be developed and operated on a modular basis.

At present, MALE class unmanned aerial vehicles in Europe are operated exclusively in restricted airspace, segregated from general air traffic. This is a limiting factor both for the employment of and for exercise activities with these systems. With the new project, the participating nations aim at overcoming these limitations. The objective is to achieve participation in general air traffic. To this end, in addition to the technical requirements for type certification in accordance with EMAR², which implements the civilian EASA³ criteria in the military world, the necessary regulatory framework has to be provided. sovereignty on a small scale will ensure clear responsibilities and greater sovereignty on a large scale.

From the very beginning, the European drone project will be analysed using modern and targeted project management methods. It will be set up in the PMO3 group for the national contribution. Given



The TLVS (Tactical Air Defence System) program is managed by PMO2.

A decision on the development and procurement of the system, based on sound cost estimates submitted by industry, will be made upon completion of the study. In the meantime, it will be determined whether additional European partners wish to participate in the project. It is a positive sign that Belgium has taken initial steps toward the project and assumed official observer status. However, the actual development and procurement of the system will not start until the capability requirements of the participating nations have been sufficiently met. There is a consensus among the nations involved at present that the partners will have to be given full sovereignty over the system. The development phase of the European drone could start in 2019. The aim is to carry out an initial flight in 2023 so that the first production systems could be delivered in 2025, giving the nations initial operational capability.

The Lead Nation principle intends to ensure effective and efficient cooperation among the nations. As a result of negative experience from previous multinational armaments projects, there has to be one company also on the industry side that has to take on the leading role. This is to make the projects more manageable. Giving up

the current status of the project, the PMO3 group is currently rather small. In the working groups of the definition study it therefore receives support from internal and external experts. In this way, tried and tested methods, experienced personnel but also external expertise are interlinked. If necessary, more external specialists, e.g. engineers, provide specific input to the study. These approaches are aimed at actively managing armaments projects tailored to the needs of the armed forces as well as being able to make a professional and focused appearance on the international stage. For the European drone project, this is a particularly important aspect, as the four partner nations – Germany, France, Italy and Spain– have very high demands on the system to be developed and an ambitious schedule. To implement the project at European level, OCCAR has been tasked with concluding, on behalf of the programme nations, the necessary contracts with the companies involved: Airbus Defence and Space, Dassault Aviation and Leonardo. In addition, OCCAR involves the European Defence Agency (EDA), which is to provide expert support in the field of airspace integration and establish important links to other European organisations such as EUROCONTROL or EASA in order to advance the creation of the regulatory framework required for unmanned systems.

² European Military Airworthiness Requirements

³ European Aviation Safety Agency

Combat Directorate (K)

The portfolio of the BAAINBw Combat Directorate (K) comprises ship-based and airborne armament systems and ground-based air defence systems, infantry, engineer and artillery systems as well as ground-based weapon systems and related components like main battle tanks and armoured transport vehicles.

A fter the TADS project having been included into the program organization (PMO), division K3 has been disbanded and the remaining branches with their systems were transferred into division K4. Thus, the directorate K is now made up of three project divisions with five branches each:

Branch K4 comprises air-/ship-borne armaments systems, anti-armour systems and ground-based air defence systems.

Branch K5 is responsible for projects regarding armoured combat and transport systems, bridges and crossing equipment. Branch K6 deals with artillery and mortar systems and their ammunition, infantry weapons and ammunition as well as engineer ammunition.

The general task branches Economic and Technical Affairs (K1) and Economic and Legal Affairs (K2) support the project branches in performing tasks in the field of project and user management and research and technology. Further support elements are the Directorate Staff and the Directorate Controlling.

The Economic and Technical Affairs Branch (K1) is responsible for planning and realising all research and technology activities in the field of ground-based weapon systems and supporting the directorate in all userrelevant, logistic, technical and defence technological matters that affect more than one project.



Gun turret of the MANTIS air defence system

Branch K1.1 is the central armament, inservice use and logistics element for the Combat Directorate. This comprises the central office for ammunition safety, all directorates' cross-project tasks in the fields of armaments management, in-service use and logistics and the functional supervision of the Bundeswehr technical centers WTD 52 and WTD 91.

K1.2 evaluates systems and assesses costs, i.e. supports the system-specific part in the development of weapon sys-

tems, evaluates the technical and tactical system performance, conducts costbenefit analyses and models and assesses the effect of ammunition against ground targets and air targets. Network centric operations, increasingly required by intelligent mobile platforms, are handled by K1.2 under the topic "systronics". Branch K1.3 is responsible for fuse tech-

nology and documentation. Projects are supported by materiel documentation. State-of-the-art technology is used in



the preparation of "Interactive Electronic Technical Documentation" to support the users. K1.3 also manages projects on fuse technology and initiates and conducts relevant research and technology studies.

The branch manages the "Joint Fire Support" (JFS) project.K1.4 realizes the joint capability to provide mutual fire support for the tactical level of land, air and naval forces as well as special forces in all dimensions of the theatre.

Research and technology, system technology activities as well as international cooperation tasks are pooled in branch K1.1, which takes charge of these matters for the entire directorate. Among others, K1.1 handles and coordinates all fields of technology within its responsibility. The main focus is on protection, ground vehicles, autonomy, weapons, ammunition, missiles and rockets, extended air defence and the soldier as a system.

The five branches within the K2 Division for Economic and Legal Affairs are in charge of public procurement, contract management and contract award for the Combat Directorate. These branches prepare, conclude and manage contracts for the individual projects as well as contracts that affect more than one project within the directorate's area of responsibility. This includes - as was the case in the past contracts on the in-service phase of defence materiel. Furthermore, the contract branches support the projects by concluding national and international agreements. One branch of this division is specialised in matters of pricing regulations for public contracts and in charge of negotiating prices with contractors.

Division K4 "Air Defence, Guided Missiles for Ships and Aircraft, Airdropped Ammunition, Antitank Warfare" is the direc-



Infantry Light Multirole Guided Missile System (MELLS)

torate's centre of competence for guided missiles.

Branch K4.1 deals with antitank systems, aircraft-based guided missiles engaging targets on the ground and airdropped ammunition (guided and unguided bombs).

K4.2 is responsible for the ship-based missile systems RAM, ESSM and RBS 15 and the future-oriented activities as regards a prospective generation of long-range land/sea target missiles and an active selfdefence of submarines with missiles that can be fired by the submarine.

Branch K4.3 works on aircraft-borne missiles against air targets. Currently, this concerns the projects Meteor, IRIS-T, AM-RAAM and Sidewinder.

Branch K4.4 deals with the projects and products PATRIOT and the Surface-to-Air

Missile Operations Centre SAMOC. What is special about SAMOC is the capability of connecting individual systems and higher operations centres and providing a joint situation picture.

K4.5 is responsible for the short-range surface/air weapon systems Mantis NBS C-RAM and light air defence system. In the near future, the preparation of the capability gap and functional requirement document "Protection in the Short Range and Very Short Range" will be one of the focal points. Division K5 "Armoured Combat and Transport Systems, Bridges and Crossing Equipment" is divided into the following branches:

Currently, the main focus of branch K5.1 is the modernisation of altogether 104 LEOPARD 2 main battle tanks to the most



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EUROFIGHTER and METEOR system

recent version LEOPARD 2 A7. Further responsibilities are the support of the entire LEOPARD family with its special versions as, e.g., the armoured recovery vehicle. Branch K5.2 has already reported about the PUMA armoured infantry fighting vehicles several times, a further focus is the service life extension of the MARDER armoured infantry fighting vehicle.

K5.3 "Heavy Weapon Carriers/Armoured Transport Vehicles" deals with the BOXER multi-role armoured vehicle and the FUCHS armoured transport vehicle. One of the main tasks was to procure a second lot of BOXER MRAV with 131 vehicles and to conclude a contract on the second lot of the project "product improvement of the FUCHS ATV". With this second lot, further 90 vehicles will be upgraded, above all regarding their armour. The main focus of work of branch K5.4 has been dealing with the extensive in-service support tasks of the FENNEK weapon system. An essential element is the realisation of further 30 FENNEK Joint Fire Support Team (JFST) vehicles. Furthermore, the branch works on the development of measures to extend the in-service life of the WIESEL 1 fleet and the construction of a system and function demonstrator "Airmobile Weapon Carrier" as a replacement for the WIESEL 1 fleet from 2025 on. The task spectrum of branch K5.5 comprises besides bridges, ferries, footbridges and boats the systems which are closely linked to them in terms dependency, namely trafficability systems like the folding trackway. As a special task, this branch also calculates and determines Military Load Classes (MLC) for Bundeswehr vehicles.





Assault Bridge System with a 26 m bridge

Division K6 deals with the ammunitions of the Bundeswehr small/medium/large calibre guns.

Branch K6.1 is tasked with the PzH 2000 self-propelled howitzer, the MARS rocket launcher and the mortars as weapon systems for indirect fire support of the Army. The PzH 2000 self-propelled howitzer is the standard gun of the German artillery and has also been introduced in 5 other nations. The international logistic support is provided via the NATO Support and Procurement Agency (NSPA).

K6.2 is responsible for the personal and small-arms weapons, the corresponding ammunition, the pyrotechnic ammunition, hand grenades and nonlethal weapons. In this context, the branch deals with the Bundeswehr assault rifle project.

K6.3 works on the projects heavy machine gun, programmable 40 mm airburst ammunition (automatic grenade launcher), programmable 30 mm airburst ammunition (PUMA AIFV) and 30 mm ammunition with reduced range for training purposes.

Improvised explosive devices (IED) have increasingly been a threat to our soldiers in many of the countries the Bundeswehr operates in. Protection against these threats is a main focus of branch K6.4.

family



PUMA AIFV during night firing

With the FUCHS KAI ATV project, the capability of mechanised explosive ordnance and IED disposal while protecting in particular roadsides and infrastructure (buildings, bridges), is improved.

The focus of K6.5 is new, guided Army and Navy ammunition. For the Navy, the

VULCANO GPS version for firings from the 127 mm armament system of the F125 class frigate is procured. For the Army capability of point target engagement, the VULCA-NO 155 mm GPS/SAL (Semi Active Laser) is planned for firings from the Panzerhaubitze 2000 self-propelled howitzer.

Euro Spike

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Fischbachstrasse 16 D-90552 Röthenbach a.d. Pegnitz Tel: +49 -911 - 957 - 2913 Fax: +49 - 911 - 957 - 2160 E-Mail: info@eurospike.com www.eurospike.com The Air Directorate of the Federal Office of Bundeswehr Equipment, Information Technology and In-Service Support (BAAINBw) manages all military aviation projects. By taking on materiel responsibility for operational viability, the typical tasks relating to implementation were complemented by tasks relating to in-service use, distinct from the tasks of in-service and supply responsibility of the services.

or Directorate L, this meant the takeover and fulfilment of numerous tasks from the services responsible so far, especially from the German Air Force. The necessary transfer of mostly military posts from all services led to a doubling of the directorate's posts to its current number of approximately 850.

Managing major large-scale projects and aviation-specific equipment forms part of Directorate L's project portfolio. Its spectrum ranges from highly agile fighter jets, transport aircraft as well as special aircraft, stateof-the-art helicopter systems, unmanned oritised projects via the Federal Ministry of Defence, Planning Directorate), and throughout the implementation and inservice support phase through

- management and support of all projects relating to manned and unmanned aircraft as well as aerial and space-based reconnaissance systems of the Bundeswehr and
- system engineering and integration of subsystems, including armament as well as highly prioritised procurement in the context of "fast-track initiatives for operations".



Ground-to-air armament

aircraft, tactical drones, and space-based reconnaissance systems to rescue and protection systems for the crews, simulators, and training equipment. Additionally, the Directorate is responsible for maintaining operational viability of both older and newly introduced in-service weapon systems. Nearly all large-scale projects are realised in multinational, predominantly European, partnerships and management agencies. The Air Directorate attends to its assigned (weapon) systems basically throughout the entire course of the project in accordance with the amended Customer Product Management (CPM (amended)) through

- system-related research and technology,
- collaboration in the analysis phase contributing to the Planning Office (for pri-

The organisational structure of Directorate L is geared towards its tasks and responsibilities regarding flying equipment as well as other products relating to it (e.g. subsystems, ground equipment, accessories, etc.):

Division L1 – Economic and Technical Affairs – has five branches working on cross-sectional and multi-project tasks of the directorate.

Branch L1.1 assumes tasks in defence research and technology (R&T). The marked features of the so-called Air and Space Systems functional area 30 include research on and provision of concepts and technologies for manned and unmanned aircraft (helicopters and airplanes), space systems including related aspects such as functional on-board systems, mission planning and control, avionics, flight control, flight management, cognition, and aircraft drive systems. Its work focuses on:

- technologies for unmanned aircraft systems (UAS) for flight in non-segregated airspace,
- aircraft drive systems,
- a system concept and corresponding technologies for a future flying weapon system (Next Generation Weapon System – NGWS) in combination with the Future Combat Air System (FCAS), taking crew assistance systems, approvability, and teaming aspects into account,
- protection of space infrastructure.

The work on these subjects is conducted within a national and international framework (e.g. EDA or NATO) in order to guarantee, among other things, a comprehensive analysis and assessment capability.

Branch L1.2 is responsible for coordinating depot maintenance planning of Bundeswehr aircraft and aeronautical accessory equipment.

Branch L1.3 is in charge of aspects specific to the in-service use of aeronautical systems, including functional supervision of the Bundeswehr Technical Center for Aircraft and Aeronautical Equipment (WTD 61) in Manching. Additionally, the following tasks will be dealt with by this Branch: preparation of the basics regarding the elaboration of materiel responsibility for operational viability of aircraft and aeronautical equipment and regarding the business processes of the logistics main process; coordination of the contributions within the framework of the Integrated Planning Process (IPP); IT support for Directorate L as well as the realisation of further cross-sectional tasks.

Branch L1.4 takes care of tasks of BAAINBw from the area of materiel documentation in terms of materiel responsibility for operational viability. In addition to comprehensive process and policy matters, this mainly includes flight and technical documentation and spare parts documentation for aircraft, aeronautical equipment and further assigned material that is used by all organisational areas.

Branch L1.5 is responsible for in-service software maintenance of flying weapon

systems and cooperates with the Combat Aircraft Systems Center in Manching and the Helicopter Systems Center in Donauwörth.

Finally, Branch L1.6 provides the specific competence for aeronautical test rigs, automatic test systems, and for common ground support and test equipment as well as maintenance depot equipment.

Division L2 – Economic and Legal Affairs –, which consists of five branches, offers project support relating to legal and contractual matters (Branches L2.1 to L2.4) and conducts price negotiations (Branch L2.5) within the framework of setting up contracts and contract administration. Moreover, Division L2 supports the projects in the context of international negotiations and agreements.

The other five Divisions L3 to L7 of the Air Directorate are mainly geared towards specific products and projects. The major task of the Divisions L3 to L7 is to supervise products and services in the abovementioned spectrum across their entire life cycle. The Divisions' responsibilities are as follows:

L3: In-service transport and special aircraft; the P-3C ORION long-range maritime reconnaissance and maritime surveillance aircraft; TORNADO; rescue, special flight and parachute systems; aviation aspects in the current regulatory context. In this connection, it is worth noting that L3 performs duties of the holder of a military type certificate. Branch L3.5 also takes on tasks relating to flight safety, such as, among other things, handling of incidents (e.g. aviation accidents), licensing of flight personnel of the armaments sector, and granting of flight operation special permits (flight operation during the weekend, supersonic and low-level flight, etc.)



Formation flight

L4: All Bundeswehr helicopters/rotary wing aircraft, such as UH Tiger, NH90, and the future heavy-lift transport helicopter. L5: Air and space-based reconnaissance

systems, such as SAR-Lupe or Heron TP; electronic warfare, including drones. L6: EUROFIGHTER.

L7: A400M transport aircraft as well as the directed infrared countermeasure DIRCM for enhanced self-protection.

EUROFIGHTER as Example

The broad spectrum of project duties is illustrated in excerpts at the example of the EUROFIGHTER representing the wide variety of other projects.

The EUROFIGHTER programme is a multinational joint project between four NATO partners (DEU, GBR, ITA, ESP). Delivery of the 143 aircraft ordered by DEU began in early 2003 and will last until 2018.

The export nations Austria, Saudi Arabia, Oman and Kuwait, in addition to the NATO programme nations, use the EUROFIGHT-ER weapon system or have initiated its procurement. The operational tasks of the Bundeswehr also require newly imple-



AESA Radar

mented weapon systems, as the vital pillars of military capabilities, to be constantly adapted to the changing threat scenarios. The example of the EUROFIGHTER demonstrates that substantial further efforts are necessary in order to prepare the weapon system for the challenges of the upcoming decades.

In this context, the focus currently lies on the advanced development of a multirole capability with additional roles ranging from air strike to tactical reconnaissance. With the implementation of the so-called role adaptation, the Guided Bomb Unit (GBU) - 48 air-to-ground weapon will be fit to be used with precision against targets on the ground with the help of the LITEN-ING III laser target marker. The Bundeswehr provides this air-to-ground role for possible operations within the scope of NATO from 2018 onwards. The Operational Developments in Time for NATO (ODIN) subproject was established in order to bundle the contributions that are needed for this purpose. First of all, the priority must be to implement the delivery services from national and international contracts and coordinate them in such a way that they can be supplied in time by NATO for the equipment and operation of aircraft, for operational testing, and for capability training and verification. As another component of ODIN, the METEOR medium-range air-to-air missile is to be integrated into the weapon system as follow-on armament of the AIM120 AMRAAM¹. The required conversion of the first aircraft for METEOR is slated to begin mid-2018.

The armament is supposed to be complemented by integrating further allweather capable air-to-ground weapons into the tranche 2 and 3a aircraft after the completion of ODIN. The objective is to achieve scalable effects against a wide variety of targets on the ground through a balanced armament mixture. The capability build-up should be realised in cooperation with the EUROFIGHTER partner nations, if possible. Achieving a consistent configuration standard is a major goal for the weapon system to be operated on this basis in an economic manner.

In order to keep the sensor systems of the EUROFIGHTER weapon system in a "firstclass" state, an advanced Active Electronically Scanned Array (AESA) Radar is currently under development. The necessary contract was concluded on behalf of the partner nations Great Britain, Italy, Spain, and Germany between the NATO agency NETMA and the company "Eurofighter Jagdflugzeuge GmbH" at the end of 2014. The commissioned development including integration and industrial trial and evaluation is scheduled to be complete in 2021. Germany's plan is to install the AESA radar into tranche 2 and 3a aircraft.

The AESA radar will be much more efficient than the mechanical sweep antenna radar currently in use. Thanks to the nearly undelayed rotation and control of the radar beam, different complex radar functions can be used at the same time. This also allows for the parallel engagement of targets in the air and on the ground. The planned hardware and software modifications will result in improved agility, enhanced detection and identification capabilities, and an overall increased reliability in terms of tracking of targets. The improved man-machine interface will have a major impact on the efficiency of the weapon system as a whole, for example by taking pressure off the pilot during the execution of a mission. In addition, the scheduled installation of a multichannel receiver will enhance the sensor performance. Altogether, the AESA radar will considerably improve the EUROFIGHTER's tacticaloperative capabilities in all its roles. Moreover, it is a decisive prerequisite for successfully conducting operations in the future. Finally, it is vital to keep improving materiel maintenance processes. In the light of continuously rising maintenance costs and simultaneously shrinking financial resources, the EUROFIGHTER partner nations have agreed in 2014 to resolutely counter this trend in an effort to increase materiel availability significantly. So far, repair and reprocurement of spare and exchange parts for the operation of the EUROFIGHTER weapon system could be ensured through a number of international contracts. Within the framework of these contracts, industry was obligated to adhere to specified repair time frames for a very limited number of exchange parts for the airframe and equipment only. Timely availability of spare and exchange parts could hence only be ensured to a limited extent. In order to improve logistic supply and thus operational readiness, the partner nations have agreed to conceptually draw up a new repair and support contract (Contract C#3) that is to be concluded with "EUROFIGHTER Jagdflugzeug GmbH". One major distinction from the old contracts will be the conversion of logistics of the EUROFIGHTER weapon system into an availability model in accordance with the principles of Performance-Based Logistics (PBL). These logistic services will then be provided by the respective "EU-ROFIGHTER Partner Company (EPC)" in each country.

The above-mentioned examples illustrate that the complex future requirements within the EUROFIGHTER project can only be met in cooperation and with harmonised efforts between the partner nations and international industry. This is why each user should support investments in multinational measures so that operation and further development can be ensured and realised at affordable prices made possible by economy of scale effects.

1 Radar-guided air-to-air missile (AIM: Air Intercept Missile, AMRAAM: Advanced Medium-Range Air-to-Air Missile)

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Sea Directorate (S)

The Sea Directorate is responsible for all matters related to the realisation and in-service use of Navy ships and boats, the Navy-specific shore-based systems, communication systems, training installations and other Navy-specific equipment. It supports the units from the first stages of realisation to disposal, thus bearing the materiel responsibility for the units, systems and equipment assigned to the Directorate "from the cradle to the grave".

he Sea Directorate consists of a total of six divisions, each with a different focus of activities, of the Directorate Staff and the Directorate Controlling. Within this organisation, three project divisions support the units afloat:

- Division S3: Surface (frigates and corvettes)
- Division S4: Subsurface (submarines, mines, mine countermeasures, subsurface weapon systems)
- Division S5: Support Units, Auxiliaries and Support Systems

For every ship class, there is one project manager in charge of the armaments and/ or in-service support management tasks. The project managers run "integrated project teams" through all phases of the (amended) CPM.

Apart from the project divisions, the Sea Directorate has three functional divisions which support the projects. These divisions are: Economic and Technical Affairs (S1), Economic and Legal Affairs (S2) and Navy C2 Systems (S6). The six divisions are closely interlinked in one matrix organisation.

In addition to its functional tasks, Division S6 is also in charge of the project management of the shore-based systems and training installations of the Navy, as well as of the project management for the integration of the enhanced RAM missile system into the combat management systems of corvettes and frigates. Branch S6.4 is the qualifying authority for combat direction systems software and releases IT system configurations for use on the ships and boats and associated shore-based systems and training installations of the Navy.

The reorganisation of the Sea Directorate became effective on 1 March 2016. It included the creation of two new branches within Division S1 and the transfer of project MKS 180 from Division S3 to the newly created Program Organization (PMO). The newly created Branch S1.4 is in charge of Navy-specific logistics and master data management and in-service organisation within the scope of SASPF. Branch S1.5 is the qualifying authority for maritime equipment and, at the same time, the coordinating authority for the qualification of



The frigate SACHSEN was the first of class to undergo the conversion.

naval weapon systems. Apart from that, the branch performs tasks related to ship safety.

The following is a representation of the current status of selected projects of the Sea Directorate:

Hardware Regeneration (HWReg) Combat Direction System (CDS) Class 124 Frigate

Those IT components of the Class 124 frigate (F124) combat direction system (CDS) that are not supportable anymore will be replaced in the future within the scope of hardware regeneration. Additionally, the operational software will be ported to a modern software architecture.

The contract amounting to approx. 65 million Euros on the realisation of "HWReg CDS F124" was concluded with a consortium of two companies, Atlas Elektronik and Thales Defence & Security Systems GmbH, on 18 December 2012.

As of 12 January 2014, the frigate SACH-SEN was the first of class to undergo this conversion, passing the sea acceptance trials on 16 February 2016. The subsequent operational suitability testing, including functional chain and suitability tests and live firing (ESSM, SM-2 and RAM guided missile firing) in April 2016, was successfully concluded on 15 June 2016. On 30 June 2016, this operational suitability testing led to the decision to convert the second of class, the frigate HESSEN.

The frigate HESSEN underwent conversion and sea acceptance trials from 18 July 2016 to 12 April 2017. The conversion of the frigate HAMBURG is scheduled for 13 September 2017 to May 2018. At the time of the conversion of the third frigate, the



pertinent shore-based systems will also be upgraded. This will take place in the second half of 2018.

Current Project Status of Class 125 Frigate

The four new class 125 frigates (F125) have been designed for long-term low and medium-intensity joint and combined military operations. Their design was dictated by several important requirements: heavy use, worldwide operation and defence against asymmetric threats.

In order to be able to support long-term stabilisation missions, the F125 was designed to allow for in-theatre deployment periods of up to two years without scheduled yard periods and with a considerably extended number of 5,000 underway steaming hours per year. At the same time, the manning level was reduced to about half the size of what it had been for classes F122 to F124, i.e. to a permanent crew of 120. This new concept is realised by selecting robust and low-maintenance systems and equipment, a high degree of automation and various other technical and organisational measures.

ARGE F125, a joint venture of ThyssenKrupp Marine Systems and Fr. Lürssen Werft, builds the vessels. The first ship of this class, the frigate BADEN-WÜRTTEMBERG, conducted the yard trial in April 2016 and started the test and evaluation programme at sea. The sea acceptance trial for the marine engineering systems, including the scheduled final acceptance trials, were successfully completed in July 2016. The trials for the combat system now involve a military crew and are scheduled to be concluded by



F125, BADEN-WÜRTTEMBERG, entering the port of Wilhelmshaven for the first time on 18 July 2016

September 2017. It will thus be available to the Navy from the fourth quarter of 2017 and undergo operational suitability testing over a period of twelve months. The other ships will be at the Navy's disposal by the beginning of 2020.

The second F125, the NORDRHEIN-WEST-FALEN, started sea trials in January 2017. At the beginning of 2019, the SACHSEN-ANHALT will be at the Navy's disposal. On 24 May 2017, the fourth ship of this class was named RHEINLAND-PFALZ.

"Four Crews, One Unit" – the Class K130 Corvette

In January 2015, the corvette ERFURT left port and did not return to her home port until 17 months later. This deployment period at sea is significant for a unit of the German Navy, demonstrating, for the first time, the principle of intensive use of a K130 corvette. During this time, the vessel participated in the UNIFIL mission as well as in the EU-led operation ATALANTA. In these 17 months, the corvette ERFURT sailed a total of about 74,000 nautical miles. During this time, the crews rotated approx. every four months. On 11 June 2016, after 510 days of deployment, the corvette ERFURT and the "Delta" crew entered the port of Warnemünde.

A long-term operation in the sea areas of the Eastern Mediterranean, the Horn of Africa and the Gulf of Aden did not lead to any significant deviations related to technical failure, maintenance intensity or the operational behaviour of systems and equipment. Still, the operation provided numerous findings in the area of logistic and personnel support. Within the scope of the "Integrated Project Team K130", an intensive exchange of experiences takes place between the BAAINBw project management and the German Navy.

The concept of the intensive use of K130 combined with the introduction of the multiple crewing concept, i.e. five crews are assigned to five vessels on a temporary basis only, has stood its first test.

Class 123 Frigate - Measures to Maintain Operational Readiness

The four BRANDENBURG-class frigates (F123), all commissioned by 1996, have been the backbone of the surface units with command and control capability of the German Navy.

Due to the age of the frigates and/or the systems on board, extensive measures to eliminate obsolescences will be necessary



After 510 days of deployment, the corvette ERFURT and the "Delta" crew entered the port of Warnemünde on 11 June 2016.

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Corvette MAGDEBURG fires RBS15 Mk3.

before long in order to maintain operational readiness beyond 2017.

In order to preserve the best possible operational availability, these measures can, in principle, only be realised within scheduled maintenance and repair periods, by a combination of coordinated measures and their respective financial planning and by using synergy effects. Preserving the capabilities of the four F123 frigates requires the modification of the combat direction system (CDS) and, closely related thereto, the maintenance of the self-defence capability, as well as the adjustment of the F123 frigates' tactical command and control capabilities to the current requirements profile. In view of the second half of service life, a change of system within the scope of a capability upgrade is thus necessary to eliminate obsolescences occurring during the in-service phase and to introduce the modern, upgradable CDS, "SABRINA 21"1.

The capability upgrade is implemented in two stages. Stage 1 includes the modification of the F123 CDS system replacing the previous structure of the central processing unit with a fully distributed, redundant system with open interfaces. The entire hardware and software are replaced. Stage 2 was authorised in February 2017 and includes further improvement of the command and control capability by integrating Identification Friend or Foe (IFF)/ NATO Identification Systems (NIS) and new software releases for the Link 16 data processing equipment.

Decompression Chamber

Within the scope of a fast-track initiative for operations, a mobile tropicalised decompression chamber was procured for the German liaison and support group in Djibouti involved in the EU operation ATA-LANTA. In just six months (the contract was concluded in December 2015, delivery was made in June 2016), a complete decom-



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pression chamber, including the peripherals required for operation, could be installed in a 20 ft container to obtain a mobile and globally available system. Apart from stateof-the art medical technology, setting new standards for Bundeswehr decompression chambers, the main focus lay on the requirement of being prepared for extreme climatic conditions in tropical regions. This very climate led to the urgent need to replace the previous system after a good ten years of use in Djibouti. The new decompression chamber was handed over to the liaison and support group in August 2016, and, in the meantime, has already stood its first test in the country's extreme summer heat and is available to the soldiers in theatre.

Current Project Status of MJ 332 CL Conversion

In the MJ 332 CL project, the IMCMS command and control system of Atlas Elektronik, which is already in use on five class 332 vessels, will also be installed on the remaining three not yet converted mine hunters of this class. Thus all vessels of this class will be equipped with the capability to use the unmanned underwater vehicle SEEFUCHS. The three vessels that are to be converted will also obtain the capability to control the surface drone SEEHUND installed on the class 352 vessels. Apart from that, a training and test facility will be procured for future simulator-aided training of naval mine countermeasures procedures in the future. Support Units, Auxiliaries, Support Systems In 2016, the focus lay upon the project and in-service management of the three combat support ships (CSS), the three intelligence collectors and the six tenders of the German Navy. The operational readiness of these units must be obtained in a sustainable manner by maintenance and logistic measures. In addition, the sometimes advanced age of most of the units requires extensive midlife upgrades and the elimination of obsolescences. This includes the propulsion systems and electric power generators of tenders and intelligence collectors, as well as the regeneration of the ship automation, the on-board cranes and the replenishment-at-sea facilities on the 1st batch of CSS. The integration of the new Navy helicopter SEA LION and the replacement procurement of the integrated mobile naval surgical hospital (MNSH) on the combat support ships are further priorities. Apart from these long-term projects, short-term requirements are continuously realised, such as the temporary integration of rigid hull inflatable vessels on the tender MAIN.

Integration of Rolling Airframe Missile (RAM) Block 2

The CDS of different ship classes is currently adjusted to control and monitor the RAM Block 2 missile. The missile used, for selfdefence against close-range air and surface targets, was further developed in the bilateral U.S.-German RAM programme. The integration into the class 130 corvettes (K130) and the class 123 and 124 frigates (F123 and F124) will make the clearly improved capabilities available and increase the self-defence capability of these operational units considerably. For the purpose of efficient maintainability, the software developers focus on the best possible universal use and a high quality standard. The respective adjustment of the CDS of K130 is currently under contract. Starting 2017, the on-board operational viability of the integrated missile will be demonstrated in extensive tests with a final system firing campaign in 2018.

For the integration into the F123 and F124 vessels, the respective phase documents were signed in July and September 2016 respectively. Thus there are no further obstacles to the successful integration of the RAM Block 2 missiles on these platforms.

J SABRINA 21: System zur Auswertung Bereitgestellter Realzeit-Informationen in Netzwerk-Architekturen des 21. Jahrhunderts (System for the Analysis of Supplied Real-Time Information in 21st Century Network Architectures)





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Land Support Directorate (U)

The Land Support Directorate (U) of the Federal Office of Bundeswehr Equipment, Information Technology and In-Service Support (BAAINBw) has a very wide range of tasks.

Starting with soldiers' personal gear, it covers military camps, medical equipment, NBC protection, military wheeled vehicles, special vehicles and equipment, EW (electronic warfare), reconnaissance, air traffic control, robotics and training/ simulation. Specific characteristics of the Land Support Directorate are:

- An unusually broad spectrum of technology-related tasks,
- A large number of projects, many of them small-scale projects,
- Distinctive procurement activities, in particular fast-track initiatives for operations.

Project work is done in four divisions with altogether 19 branches, and they receive support from the Economic and Technical Affairs (U1)andEconomic and Legal Affairs (U2) Divisions.

The Economic and Technical Affairs Division (U1) performs general, overarching tasks for the projects and the leadership of the directorate. To some extent, it also as-



Effect of master records on operational maturity

In addition, the Land Support Directorate exercises the general functional supervision over the Bundeswehr Technical Center for Land-Based Vehicle Systems, Engineer and General Field Equipment (WTD 41) in Trier, the Bundeswehr Research Institute for Protective Technologies and NBC Protection (WIS) in Munster and the Bundeswehr Research Institute for Materials, Explosives, Fuels, and Lubricants (WIWeB) in Erding. As in other directorates, the core tasks of the Land Support Directorate include:

- Project management in accordance with the Customer Product Management procedure (CPM) throughout the entire life cycle of the materiel,
- Systems engineering and integration,
- Research and technology,
- Technical support during in-service use,
 Contract management and price negotiations.

sumes tasks from projects with independent or cross-divisional responsibilities. The U1 division with its four branches serves as the directorate's central point of contact for the following:

Interdisciplinary and cross-project tasks Service use situation coordination centre

• U1.2

System aspects policy/in-service use policy Materiel documentation/maintenance (project-oriented)

• U1.3

Functional supervision of WTD 41, WIS and WIWeB

R&T coordination

- U1.4
- Master data maintenance

The Economic and Legal Affairs Division (U2)with its five branches is responsible for contract management and price negotia-

tions for the project divisions, and is organised as follows:

• U2.1 to U2.4

Contract management for project divisions U3 to U6

- U2.6
- Price negotiations

The four project divisions carry out project work in accordance with the CPM procedure (amended) throughout the entire life cycle of the materiel (implementation, use, condemnation) as follows:

• U3

Field camp technology, protection and logistic support,

CBRN and medical equipment,

• U4

Protected wheeled vehicles, Special vehicles & equipment, Integration, Protection, R&T Processing • U5 Electronic warfare, Reconnaissance, Air toffic control

Air traffic control, Identification

• U6

Training technology,

Simulation,

Robotics.

The following will provide an overview of selected tasks and projects of the directorate.

U1.4 – Materiel Master Records - Both Niche Existence and Pillar of Operational Maturity

Master records are data which remain unchanged over longer periods within IT systems. They are the basis for very different processes which are IT-supported. Missing master records often cause disruptions in the processes, whereas erroneous or incomplete data can lead to wrong decisions. Both can lead to economic damage and have a negative impact on the forces' operational readiness. Both possible effects are to be avoided for a smooth operation of the Bundeswehr.

To illustrate how all these items are related, materiel master records will be taken as example.

Materiel Documentation

In the course of weapon system developments, preparing the required materiel documentation is an essential contribution

[•] U1.1

to logistics. It reflects the project-related logistic concept which, among others, determines how to ensure the logistic support and maintenance of a product during the in-service phase. The respective master

records are part of this materiel documentation. In the period of weapon system development, the volume of master records grows gradually, and is, ideally, complete at the beginning of the in-service phase.

Necessary Requirements

Spares, for instance, can be procured either in a centralised or decentralised manner, depending on the logistic concept. Equipment can be maintained at different maintenance levels and needs to be forwarded to the respective logistic facility. During service, necessary changes of the product need to be implemented, if required also for different configurations. The aim of all these activities is to achieve operational maturity and, closely linked to Schematic depiction of the MSEA system

this, maintaining operational readiness of weapon systems in economic conditions. Every process leading to this aim is supported by IT procedures. The basic decisions within the project-related logistic concept are stored as master records in the Bundeswehr IT systems. In this way, the materiel manager for operational maturity of the Federal Office of Bundeswehr Equipment,

Information Technology and In-Service Use (BAAINBw) ensures in case of disruptions that operational readiness of products is re-established as soon as possible. From the perspective of the product user this means, for instance,

 having the correct spare available as quickly as possible,

 being able to forward a defective product to the appropriate and certified maintenance facility,

• being able to implement necessary technical changes and document the configuration baseline.

Organisation

Maintenance of materiel master records within the Bundeswehr is both centralised and decentralised. Centralised maintenance is done at the Bundeswehr Logistics Command and at the Q3 division of BAAINBw. Decentralised maintenance is ensured by the individual project managers in the BAAINBw project divisions.

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MSEA HP compressor and storage tanks in oxygen generation container

Since the establishment of the BAAINBw, centralised maintenance performed by branch U1.4 has also proven its worth. In particular, the high diversity of products in relation to the number of project managers in the Land Support Directorate and the ensuing complexity of master records management become manageable through this approach, which again ensures an appropriate support and advice for project managers.

In future, such an important complementary element is also to be established for most of the other project directorates.

IT Systems

The Bundeswehr management control system is SAP-based. Additionally, further complementary products are used. These systems together are termed SASPF. By late 2016, all articles from Systems in Use (SinN) were transferred to SASPF for logistic level 3 (in-service control at agency/command level), with some residual activity in 2017. The data which, so far, had been stored in various IT applications, was subjected to quality control for this transfer to SASPF and, whenever necessary, corrected. From this point on, data quality is improved during ongoing operations in SASPF and additionally in the old systems until their complete shutdown.

Effects

As can be seen, there are several possibilities within SASPF to actively influence inservice control. But this means, first of all, that IT systems used need to be given a foundation in the shape of a solid, possibly bigger, master record base.

SASPF offers more comprehensive possibilities and a high level of procedural integration. This achieves an acceleration of IT-based procedures. But here, too, the following principle applies: it is data that controls processes. And if the data is not valid, this leads to serious disruptions of the processes. Thus, accurate and complete master records continuously gain in importance.

A higher degree of target achievement in the framework of assuming materiel responsibility for operational maturity, therefore, means more attention to the quality of the master records.

Things will be better in future - not easier!

U3.5 – New Military Pharmacy Capability of the Bundeswehr Medical Service

In August 2016, BAAINBw transferred four of the six serial "mobile oxygen generation and bottling systems (MSEA) to the Bun-

als phase, this realises a mobile, redundant and quality-controlled supply with medical oxygen 93% for Bundeswehr missions.

Giving medical oxygen in life-threatening situations is a basic principle of emergency medical treatment. Therefore, establishing and maintaining the oxygen supply for the patient is central for emergency medicine. MSEA systems supply oxygen for medical purposes. Both medical treatment facilities for military operations and all the MEDEVAC means of transport need to be provided with medical oxygen to ensure their sustainability and thus the treatment of casualties in all situations.

Basically, missions are supplied with medical oxygen in compressed-gas cylinders, which are subject to strict transport regulations for hazardous goods. Availability of medical oxygen was, therefore, not only dependent on the military situation, but logistic conditions as well. As a result, it was not always possible to organise the transport and therefore the availability of medical oxygen, as required in the specific situation. Making the MSEA system available to the user significantly reduces this shortage.

The MSEA system consists of one oxygen generation container (20 ft), one storage container (20 ft), one interchangeable loading rack with the entire system materiel (type II standard tent, oxygen bottles, airconditioning units, accessories for auxiliary power units), as well as two auxiliary power units with a rated power of 70 kVA each.



MSEA oxygen concentrator module on platform oxygen generation container

deswehr Central Medical Service. When the units are ready to receive them, two further serial systems will be fielded before the fourth quarter of 2017. After a long triThe system filters outside air with the socalled PSA procedure (pressure swing adsorption) to generate oxygen. Generally, ambient air contains approximately 78% nitrogen and 21% oxygen. The rest is carbon dioxide and inert gas. MSEA precompresses air which flows into a so-called oxygen concentrator module with a pressure of 1.2 - 1.7 bar. After passing through tubes fitted with a molecular sieve, the air is enriched with and contains $93\% \pm 3\%$ of oxygen. The oxygen generated then is compressed to 6-8 bar and stored in two 360 liter tanks. To fill the stored oxygen into compressed-gas cylinders, two high-pressure compressors are used to compress the oxygen to 210 bar. With the MSEA, medical oxygen 93% can be filled into ten 200 bar compressed-gas cylinders, and two 127 bar compressed-gas cylinders. All sizes of German compressedgas cylinders (2 liter, 5 liter, 10 liter and 50 liter), as well as those of our NATO partners can be filled in a very short time (with gas cylinder adapters supplied). Generation and bottling of oxygen for medical purposes is in the responsibility of a pharmacy officer, in accordance with the provisions of the General Publication A 1-841/0-4000 "Regulations Concerning the Operation of Bundeswehr Pharmacies".

The MSEA was realised in two development stages. In the first stage, the mobile oxygen generation and filling system is used purely for bottling as part of a Medical Logistics Centre which ensures the filling of oxygen bottles for Bundeswehr routine duty. In the second stage, the mobile oxygen generation and filling system offers the option of direct feed, besides the bottling option. With an additional reserve container, the medical oxygen 93% that has been generated can be fed into a supply network. Via special extraction points, the supply of this viral medicine to an entire field hospital with several surgical theatres, intensive care unit, emergency unit and care wards can be ensured anytime and at the highest level of guality.

U4.3 – Heavy Equipment Transport - Tractor Trailer 2 70t

The tractor trailer 2 70t (SaZg 2 70t), also called MAMMUT, represents the new generation of Bundeswehr heavy equipment transporters. Besides a higher payload compared to the fielded truck tractor system (SaZgM), the new SaZg 2 70t FSA is equipped with vehicle protection (FSA), as opposed to the old system.

The SaZg 2 70t system currently consists of one truck tractor and three trailer variants. The 2 70t FSA EK (SaZgM 2 70t FSA) truck tractor is the traction vehicle for the overall system. Beside vehicle protection equipment, it has a complex adaptation kit with a remote-controlled light weapon station (FLW 100), a radio equipment and two 200kN Treibmatic winches. The latter can be used to independently load and unload disabled vehicles still fit for towing, in combination with the trailer variants. In addition, an 80 kN recovery winch can be fitted to the front of the truck tractor for selfrecovery. As a minor function, the SaZgM 2 70t FSA truck tractor is employable as recovery vehicle. The truck tractor has allwheel drive, an engine power of 500 kW (680 hp), and a torque of 2,700 Nm; the driver's cab houses seats for four persons. The SaAnh 2 70t trailer has a payload of 70 t and is the biggest of the three trailer variants. The 7-axle trailer can transport the heavy Leopard 2 MBT in the versions A6M and A7, and in future also the A7V. The trailer is fitted with an independent power supply for autonomous operation of the hydraulic equipment.

The SaAnh 30t is a 30 t telescopable trailer and has a payload of 30 t, which makes it the smaller variant certified for use with the SaZgM 2 70t FSA truck tractor. The 3-axle SaAnh 30t trailer can be extended and enlarged, according to the transport



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System SaZg 2 70t

requirements. Another function is the capability of transporting containers with a length of 40 ft.

As a further trailer variant, the SLT 50-2 heavy equipment transporter, which is already fielded in the Bundeswehr, was retrofitted for use with the SaZgM 2 70t FSA truck tractor, the new version now being named SaAnh SLT 50-3 "Einsatz" (mission). This offers another transport capability, using the 4-axle all-terrain trailer with a 50 t payload. The retrofitted trailer continues to be compatible with the old SaZgM system, which provides one more flexible transport capability, as required by the mission. With the delivery of the second lot in late 2016, the Bundewehr has a total of 19 SaZgM 2 70t FSA truck tractors with an equal number of SaAnh 2 70t trailers available.

U5

Division U5 deals with projects in electronic warfare (EW), radars and optronic sensors and military air traffic control. Furthermore, projects like the "infantryman of the future", height information model "TanDEM-X", as well as the entire media technology of the Bundeswehr are part of this division's portfolio.

With lessons learned from operations, countermeasures to improvised explosive devices (C-IED) and, linked to this, protection for vehicles, convoys and dismounted personnel are a point of main effort in the area of electronic countermeasures. To date, significant progress has been made with a view to the protection of military personnel. Still, continuous technological development in this area is indispensable to proactively facing the constantly changing threat potential.

Currently, Bundeswehr forces mainly employ jammers in an operational environment to counter radio-controlled improvised explosive devices (RC-IED), using this EW capability for temporary protection. Now, possibilities of causing lasting physical damage to the electronic components in the explosive devices are increasingly being examined. This technology is to be a further element, besides the jammers and protective systems already fielded, in the very complex field of C-IED.

A mobile high-performance field generator which produces electromagnetic pulses (High Power Electro Magnetics, HPEM) to deactivate electronic components is at the core of the technical realisation. The IED triggering device would be rendered harmless by this.

Both capabilities serve to increase the protection of military personnel, as well as the mobility and lethality of own troops.

Even though the U5 Division mainly concentrates on the use of HPEM for convoy protection, this technology bears considerable potential for military use, both against symmetric and asymmetric threats of all dimensions and at almost all stages of escalation. The very same technological foundation can be used, among others, to affect and stop manned and unmanned vehicles (eg. micro drones and motor vehicles). Possible future areas of employment could be the protection of facilities (ports) or checkpoints.



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Information Technology Directorate (I)

Directorate I manages the projects relating to information technology relevant for operations and command and control, which includes everything ranging from commercial off-the-shelf servers and software developed for specific purposes to full command post equipment and signal teams. The Directorate's work spectrum also includes communications devices (e.g. radio sets) and even their own communications satellites.

T nowadays forms an integral part of the Bundeswehr, from routine duty to operations and from command posts to a single weapon system. Most of the delivered systems contain IT components which have to be interconnected. That is why it has to be ensured that the IT of every system, from network connector to data format, is compatible in the context of numerous independently managed customer product management (CPM) projects.

This requires IT coordination across projects and directorates. For this reason, the Director of Directorate I has taken on a coordinating role for the entire IT of all projects, programmes and complex services under the responsibility of BAAINBw. He is supported in his role by the Bundeswehr IT system architect and the IT service designer.

Bundeswehr IT System Architect and IT Service Designer

All systems which serve the purpose of implementing the Bundeswehr IT system are being integrated into the IT architecture of the Bundeswehr IT system in accordance with the requirements formulated by the IT system architect. This is done in order to guarantee interoperability on a national and multinational level as well as to achieve a harmonised system landscape. The Bundeswehr IT system architect is responsible for attending to and documenting the compliance with these requirements. The Bundeswehr IT system architect continuously develops these requirements, also for the work of national and international bodies, and uses them to derive conventions relating to content and methods for the modelling of architectures. They are mostly used to create architectures within the framework of procurement and in-service processes.

In the Bundeswehr IT system the architecture method is to be applied on a mandatory basis for the determination and satisfaction of requirements. While the armed forces create the operational architecture, the Federal Office of Bundeswehr Equipment, Information Technology and In-Service Support (BAAINBw) develops the system architecture and the technical architecture. In doing so, the Bundeswehr IT system architect is responsible for developing the overarching architecture of the Bundeswehr IT system. The Bundeswehr IT system architect checks the project-related contributions to the IT system architecture for conformity with the requirements relating to content and methods. Then, the contributions are transferred into the overall architecture of the Bundeswehr IT system. The Bundeswehr IT system architect lends support to the projects in the form of expertise relating to content



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Description of dependencies ranging from Bundeswehr capabilities to technology via NATO Architecture Framework (NAF)



Control and optimisation in the Bundeswehr IT system

modifications to existing IT services and, more generally, on IT service management. Moreover, the IT service designer coordinates the IT service management with the Bundeswehr Office for Defence Planning, the German Cyber and Information Domain Service Headquarters, and the BWI IT as an in-house company.

The goal is the economic provisioning of modern IT services for the Bundeswehr IT system, including cloud services. The main control mechanism for this is the IT service portfolio for the Bundeswehr IT systemmanaged by the IT service designer.

The multi-project positioning of the IT service portfolio management puts the focus of attention on all dimensions of service provision (land, air, sea, space, cyber and information domain). This prevents a narrow service provision only focused on one project. Furthermore, re-use and co-use of existing IT services is encouraged.

So far, the focus lay on Directorate I and the multi-project and interdepartmental coordination. Some of Directorate I's specific projects are presented in the following.

Modernising the Bundeswehr with Encryption Technology

Cryptography plays a vital role in creating and maintaining confidentiality and integrity of information. Here, the focus lies on encryption of data in order to protect it during transmission. To do that the Bundeswehr uses a multitude of crypto equipment of different generations for varied areas of application as well as various analogue and digital communications networks and radio links. In addition, a large

Photo: Rohde & Schwarz

and methods before and during the creation of architecture.

The IT strategy of the FMoD's area of responsibility has not only effected the creation of the role of the Bundeswehr IT system architect but also that of the IT service designer, whose job it is to optimise the Bundeswehr IT system as a whole in terms of technological and economic matters. This is done by holistically controlling new projects that enhance the Bundeswehr IT system and modifications to existing projects and products.

The IT service designer is responsible for gearing the IT used in the projects, programmes and complex services towards the goals and requirements of the IT strategy.

If needed, he will advise the managers of the integrated project teams (IPT) and the project managers on the re-use of or



ELCRODAT 6-2 government device, digital (ISDN); encryption of phone, fax, data and video communication up to TOP SECRET; used by NATO, federal government, and Bundeswehr

number of proprietary transmission protocols and crypto material are put to use. Directorate I bundles the responsibility for project implementation and in-service support control for all crosssectionally employed Bundeswehr crypto devices. This multitude has evolved historically, but since the

2000s the number has been reduced thanks to standardisation and replacements with the latest generation of devices from

the ELCRODAT product family. It comprises the ELCRODAT 4-2 multirange encryption device, the ELCRODAT 5-4 crypto phone, and the ELCRODAT 6-2 ISDN government device by Rohde & Schwarz SIT. This latest generation of crypto equipment is equivalent to the technological level of the ISDN era. The crypto algorithm in use is wired in the hardware. This requires the exchangeable cryptographic module to be developed anew and exchanged with considerable effort in case of an algorithm update.

Nowadays, two-wire and ISDN connections do not suffice anymore; internet protocol (IP) technology and considerably higher data rates are necessary. Moreover, NATO standards have now also been created for the IP sector. For these reasons the crypto equipment needs a technological makeover. This is especially true because the equipment used so far will have to be replaced in the near future anyway due to its old age. These findings have prompted the Bundeswehr to establish the crypto technology modernisation project, with the objective being to replace nationally licensed cur-



Image left: ELCRODAT 4-2 multirange encryption device, analogue and digital; encryption of voice and data information up to SECRET; use in stationary, deployable, and mobile communication systems. Image right: ELCRODAT 5-4 crypto phone, analogue and digital (ISDN); encryption of phone, fax and data communication up to SECRET; used as office device

rent crypto equipment with equipment fit for the future. The project consists of two subprojects:

1. Replacement of cryptographic modules of tactically employed aeronautical radio equipment with software-defined cryptographic modules.

2. New development of a standard encryption device in several versions (office and tactical version) as well as a crypto phone with regard to new developments and applications of new technologies.

First, further research and technology studies are to be conducted in order to minimise development risks. The future evaluation process should be seamless. This is why BAAINBw collaborates closely with the Federal Office for Information Security (BSI), which is responsible for the evaluation.

Special IT Systems

The term "special systems" denotes the systems of military intelligence, computer network operations, and arms control. The in-service systems are subject to continuous further development due to shifting political and legal frameworks, changing military requirements, or technological progress.

Two projects taken from the special system spectrum are illustrated in the following.

Project "Data Processing Equipment for Military Intelligence Terminal" The operational experience of the German forces from recent decades and the latest security-political developments across the globe have highlighted the indispensabil-

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Data processing equipment for military intelligence terminal in context with sensor system and the composite intelligence collection and reconnaissance system

ity of unrestricted and independent access to findings gained from satellite imagery interpretation.

The "data processing equipment for military intelligence terminal" project is the only Bundeswehr system used for requesting, creating and distributing as well as archiving analysis products in the task area of worldwide satellite imaging reconnaissance.

The analysis products created with IMINT (Imagery Intelligence) and GeoINT (Geo Intelligence) obtained within the project represent a considerable contribution to securing the independent political and military capability to judge, decide, and act.

Main user and operator is the Imagery Intelligence Center located at the site of the Strategic Reconnaissance Command in Grafschaft-Gelsdorf, which will be transferred to the organisational area Cyber and Information Domain on 01 July 2017. The following can be used for the creation of analysis products: national (e.g. SAR1-Lupe) or commercial (e.g. WorldView) satellite imagery as well as such imagery stemming from international cooperations (e.g. HELIOS II); findings from the composite Intelligence Collection and Reconnaissance system (IC&R) and other external sources. Operational forces abroad can be supported with findings gained from satellite imagery interpretation by using the reachback procedure via mobile and deployable operational equipment.

1 Synthetic Aperture Radar

Some vital features of the project are the bundling of all non-sensor-specific tasks of worldwide satellite imaging reconnaissance in a central, efficiently working data processing system as well as a high degree of automation of procedural steps of the "intelligence cycle".

The further development of the IT system in the form of a new CPM project is scheduled for 2018 to 2021. The reasons for this are the necessary adaptation to new Bundeswehr sensor systems for satellites (e.g. SARah) and the generally increased requirements, also within the framework of international cooperations (e.g. CSO²), placed on satellite imagery interpretation.

Project "Command and Control Information System for the Verification of Arms Control Measures (VERIS-DV)"

Based on various contracts and agreements, the Federal Republic of Germany has rights and obligations relating to the area of arms control. The Bundeswehr Verification Center, located at Geilenkirchen, is the main point of contact with regard to the planning, conduct, and evaluation of arms control measures as well as for the development of contributions to the corresponding concepts and negotiations. In order to fulfil its tasks, the Bundeswehr Verification Center is involved in the control and coordination methodology via the Federal Foreign Office and the Branch Pol II 4 in the Federal Ministry of Defence.

The "Command and Control Information System for the Verification of Arms Control Measures (VERIS-DV)" was implemented as an additional special IT system to support the verification of cooperative arms control measures. The Bundeswehr Verification Center is the only operator and user of this system.VERIS-DV forms a network consisting of 30 servers and approx. 220 computer terminals. It supports the command and control process as well as the specialised and administrative procedures, including preparation and follow-up activities of arms control inspections. The VERIS-DV functionalities and services have been adapted to specific contracts and requirements in various stages of development building upon each other, always striving towards harmonised actions in the context of command and control information systems. This includes data processing based on databases, standardised reporting procedures, and centralised situation display. Interfaces for external data exchange make it possible to involve further parties (FMoD,



Involvement of the Bundeswehr Verification Center in the control and coordination methodology of arms control

² Composante Spatiale Optique

NATO and other authorities (Federal Foreign Office)) in the verification process of arms control measures.

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A separate training system for our own international contractual partners forms an integral part of the IT system. tonomous subsystem and provides up to 20 training terminals, if needed.

A software development environment has also been implemented as a subsystem. It was modelled after the operational system and functions as a tool for software maintenance and update for the software specifically developed for VERIS-DV. The Bundeswehr Verification Center personnel takes care of these procedures in collaboration with the system maintenance personnel of the contractor. From 2017 to 2019 the system is being regenerated (hardware and standard software).

What Does 2017 Have in Store?

The new coordinating role of the Director I for BAAINBw IT matters brings about new challenges but also new opportunities. BAAINBw's organisational structure now also lives up to the multi-project and IT Service (Tablet) **IT-Service Building Blocks** Customer 5 1 Warranty

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interdepartmental nature of the IT sector. The new, complex interfaces to the Cyber and Information Technology Directorate of FMoD and to the newly created German Cyber and Information Domain Service Headquarters are bundled on the armaments personnel side; at the same time, requirements of the IT strategy are being operationalised and realised as control impulses. Comprehensive control of IT, an IT strategy requirement, is thus possible. Several new IT projects, e.g. German Mission Network (GMN) or Mobile Tactical Communication, are bringing about the urgently necessary modernisation of IT relating to command and control across all levels of command and down to the tactical level. The challenge for the next few years will be to maintain operational readiness for in-service systems while also gradually to replace them with the new systems. Bold and simple: the Bundeswehr IT System is getting a makeover, but overall operation has to go on.

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Information Technology Support Directorate (G)

In accordance with the IT strategy of the Federal Ministry of Defence, supporting the performance, main and business processes with information technology is an essential factor of success for the effectiveness and long-term viability of the Armed Forces. Directorate G at the Federal Office of Bundeswehr Equipment, Information Technology and in-Service Support (BAAINBw) is responsible for the operation, realisation and further development of the Bundeswehr-wide IT application and system environment to support the logistic and administrative processes.

The directorate's tasks are performed in 5 divisions and specific management bodies.

Division G1 Economic and Technical Affairs is the central conceiving and planning hub for logistical and administrative IT support and its architecture. This division is also responsible for the demand and IT service management and provides the necessary technical equipment and the services related to the different applications which are necessary for the smooth operation of the applications. Further tasks of G1 include overarching coordination as part of the overall SASPF (Standard Application Software Product Family) planning and resources management. The head of division G1 is the SASPF project manager at the same time.

Division G2 Economic and Legal Affairs is responsible for contract management for

all services awarded by Directorate G. Divisions G3 (Personnel, Organisation, Individual Training), G4 (Logistics, Armaments, Infrastructure, Environmental Protection) and G5 (Planning, Accounting, Controlling, Health Care, Special Areas) have been set up in a process-oriented way. The branches of these divisions assess the requirements for the respective main and business processes together with the responsible main process managers, design IT solutions, implement applications, role them out and ensure their operational readiness, also providing user support. These services relate to SASPF, i.e. SAP standard software and complementary products as well as systems in use including all relevant interfaces.

In last year's issue, we already introduced the SASPF Customer Centre of Expertise/ Systems In Use which controls the required IT service management processes. Additionally, in the course of the agenda "Aktiv. Attraktiv. Anders." (An Active and Attractive Alternative) it is important not only to provide IT services for the Bundeswehr in accordance with the agreed service level but also to modernise the whole IT landscape in a viable way and to further increase the satisfaction of the users. In the



Start window of the e-recruiting portal as a central entry point

following, we will present a few examples of successful adaptations and further developments of IT support under the responsibility of the G Directorate.

Adaptation of Departmental Budget 14

The restructuring of all departmental budgets, which was decided by the budget committee of the German Bundestag, was a major challenge with regard to IT. This change also affected the FMOD departmental budget 14 and required the technical adaptation of all budget-relevant SASPF IT procedures and IT procedures of the respective systems in use. A steering group especially implemented for this task coordinated the required project management activities and project adaptations. It was a ministerial requirement to adapt the systems around the turn of 2015/2016 without major restrictions for the users or impairments for the drawing up of the annual financial statement. Comprehensive preliminary analyses, a dry run that was already conducted in mid-2015 and a system test that was conducted in the autumn of 2015 were the preconditions for a timely and flawless adaptation.

During the hot phase around the turn of the year it was particularly important to avoid data inconsistencies. To achieve this, it was necessary to appropriately restrict the use of the SASPF systems for a period of two weeks without jeopardising the operational capability and readiness of the Bundeswehr. First and foremost, a continuous use of the system was made possible for selected users in the German Air Force to guarantee operational flight missions. These special regulations were imperative for the aircraft required in the operational areas of Afghanistan and Syria and in SAR duty readiness, among others.

Due to the major commitment and the excellent cooperation of all participants at BAA-INBw, at the Federal Office of Bundeswehr Infrastructure, Environmental Protection and Services (BAIUDBw), the Bundeswehr Joint Forces Operations Command and the Headquarters of the German Air Force, it was possible to adapt the IT as planned and without any rework. The findings gained and the identified optimisation potentials will be used as lessons learned in order to further shorten periods of system restrictions during future adaptations of complex data structures.



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E-recruiting

The Bundeswehr requires highly qualified and motivated personnel. In addition to the current Bundeswehr recruitment measures, it has been an objective to further digitalise the existing recruiting processes and to provide an appealing e-recruiting portal.

As a subproject of the **agenda "Aktiv. Attraktiv. Anders." (An Active and Attractive Alternative)**, e-recruiting is a part of the career portal, the relaunch of which was realised and implemented in parallel (www.bundeswehrkarriere.de). The career portal offers comprehensive information on all Bundeswehr career paths specifically tailored to all target groups. If interested users have decided to apply, they will be immediately forwarded from the career portal to the e-recruiting portal. Here, they find all the relevant job advertisement information which is required for an application for a military or civilian career path in the Bundeswehr. The portal is also open to all internal staff interested in changing their position within the Bundeswehr. After an appropriate user registration, it is possible to create an applicant profile.

All data and documents, which in the past had to be sent to the responsible Bundeswehr agency by mail, can now be processed centrally and can be used for several parallel applications. In order to enable a state-of-the art access to the recruiting portal even via mobile devices (tablets, smartphones), the design of the application portal automatically adapts to the end device in use. Therefore, there has been no need for programming individual apps for the mobile platforms (e.g. iOS, Android). As e-recruiting is the first SASPF application of the Bundeswehr which is freely accessible on the internet, a special focus must be on IT security and data protection.

In a second step, all required background processes were rolled out in the relevant

agencies in order to make announcements of vacancies, training posts and internships possible. Furthermore, a staff portal went live on the Bundeswehr intranet which combines and replaces the previous internal job boards (internal vacancies announcements, vacancies announcements of international organisations and/or of agencies outside the Bundeswehr). When realising a third element of e-recruiting, the focus will be on the processes of selection and staffing of the Bundeswehr Career Centre and the Assessment Centre for Executive Personnel of the Bundeswehr.

By the end of September 2016 there were already 42,600 registered users. Of those, about 27,500 had released their profile for career counselling or had used it for an online application. Through the activation of the recruiting portal, essential project objectives have already been achieved and the present numbers of users and applicants show that the platform is well accepted. By realising the e-recruiting project, an important milestone of the Bundeswehr attractiveness agenda has been implemented in a very successful way.

AI Awarding Manager

A further important innovation in 2016 was the introduction of an awarding software by Administration Intelligence AG, which is called AI Awarding Manager ("AI Vergabemanager"). This IT support enables a paperless, electronic processing of the awarding process starting from the application for contract to the gathering and checking of tenders up to contract conclusion. The reason for the implementation was in part the modernisation of the contract award law in April 2016. According to the Regulation on the Award of Contracts, all publications now have to be made electronically. The required information has to be provided to the tenderer free of charge in an unrestricted, complete and immediate way without further registering. In order to make this possible without media conversion, the AI Awarding Manager is used in combination with the federal eawarding platform. There will be no timeconsuming printing and mailing of comprehensive awarding documentation and tenders. The representation of all required process steps in one workflow guarantees a complete processing in conformity with legal requirements. This clearly facilitates work for the tenderer and for the awarding authority alike. Using the AI Awarding Manager is thus not only a mere adaptation to the chanced legal situation but also a step towards a more efficient cooperation between industry and Bundeswehr.

Optimised Interfaces for Aircraft Mechanics in Flying Units

As a pilot measure for the provision of modern user interfaces, an optimised user interface for aircraft mechanics of flying units is presently being developed in SASPF under the direction of BAAINBw Directorate G. It is planned to simplify this interface, to gear it to the tasks of the aircraft mechanics and to employ it in all flying units of the Bundeswehr in the medium term. The implementation is conducted in three phases: identification of contents and of a practicable design, drawing up of the corresponding data model and subsequent realisation with SAP UI5 and SAP Fiori, the standard tools for designing demand-oriented interfaces in SASPF.

In order to prepare the design, in the first guarter of 2016 a design thinking workshop was conducted under the command of the Headquarters of the German Air Force. The objective was to use the know-how and the requirements of the future users directly in order to draw up the technical requirement so that the preconditions for a user-friendly and optimal implementation would be set. In order to take the interests of all flying units into account, numerous aircraft mechanics of 33 Tactical Air Wing as well as representatives of the Army and the Navy and the Bundeswehr Logistics Command were involved.

As part of the design process, the tasks of an aircraft mechanic were analysed and the need for optimisation in relation to the present SAP GUI interface standard was determined. Several workshops were facilitated and conducted by design thinking experts of the company SAP in order to achieve these objectives. Regular presentations and discussions of the results first of all led to a prototype of an optimised role-based interface for aircraft mechanics in flying units.

In parallel, the German Air Force Headquarters formulated the technical requirements on the basis of which the data model will be drawn up. The advantages of the new technology will be, among others, their multi-device capability and the modular design of the applications, which enables a later integration into other applications.

A first test roll-out at the 74 Tactical Air Wing in Neuburg was successful. The results indicate a significant relief for the aircraft mechanics. Regarding the documentation of the work on the aircraft, the amount of mouse clicks could be reduced by about one third for the aircraft mechanics. The applied agile project management with regular consultations and quality control measures guarantees that the application corresponds to the actual requirements of the users. After another test rollout in July to save and process them in significantly more efficient memories. With a new data modelling concept, the Bundeswehr increasingly employs data virtualisation in its data processing centres instead of copying



A project to migrate SASPF Business Warehouse to SAP BW powered by HANA (BW on HANA) was realised in 2016 in cooperation with BWI Systeme GmbH.

2017 at 3 Naval Air Wing in Nordholz, the large-scale rollout in all flying units of the Bundeswehr is planned to begin in the third quarter of 2017. Besides user friendliness, the operational readiness of the aircraft shall be increased by reduced turn-around times.

Business Warehouse on HANA (BW on HANA)

Increasing digitalisation creates quickly growing amounts of data, also in the Bundeswehr. To manage them and to assess them more quickly, highly efficient technologies are required. The objective is to create reliable and sustainable information as a basis for sound decisions in a shorter period of time. Here, the Bundeswehr employs SAP Business Warehouse powered by SAP HANA®.

On 14 March 2017, the CIT director in the FMOD, Klaus Mühleck, implemented the SASPF programme strategy. A central content of this programme strategy is to take technological trends and innovations like in-memory technologies into account. In anticipation of this, a project to migrate SASPF Business Warehouse to SAP BW powered by HANA (BW on HANA) was realised in 2016 in cooperation with BWI Systeme GmbH.

The basic idea of BW on HANA is, among others, not to continue saving the continuously increasing data volumes on comparably slow server hard drives but and aggregating data between the different levels of architecture of the servers and saving them redundantly. As a result the architecture layers will be used less and data modelling and data organisation will be less complex. This reduces the development and maintenance effort for projects and for operation while simultaneously accelerating the processing of data retrievals. With the successful adaptation of the SASPF Business Warehouse production system, a future orientated basis has been created to react to new requirements more quickly also if major amounts of data (big data) need to be processed. This constitutes a paradigm change within the technology which had been used in SASPF so far.

Outlook

For all Bundeswehr agencies, the implementation of measures of the **agenda** "Aktiv. Attraktiv. Anders." (An Active and Attractive Alternative) was one of the priorities of the work in 2016. Directorate G in BAAINBw, too, has successfully supported this agenda with numerous IT projects and IT measures which could only be described here in part, in close cooperation with the Bundeswehr major organisational elements and the industrial partners. By realising a large number of further IT projects in 2017, Directorate G will continue to advance the digitisation of the Bundeswehr.

The HERKULES Special Organization

On 28 December 2006 the structure of the Bundeswehr IT saw a profound change. It was the day the HERKULES prime contract was signed, and thus the BWI Informationstechnik GmbH (BWI) was founded, with the Federal Government, Siemens Business Services GmbH Co. OHG, and IBM Deutschland GmbH being the associate partners.

he HERKULES Special Organization (SO H) is responsible for project control on the directorate level in the Federal Office of Bundeswehr Equipment, Information Technology and In-Service Support (BAAINBw). Moreover, it has interfaces with other Bundeswehr IT areas. Within the framework of the contract, the non-military IT of the Bundeswehr was modernised and many IT components were made compatible for standardised operation.

The HERKULES prime contract expired as planned on 27 December 2016. Although the Federal Government became the sole holder of BWI on 28 December 2016, the in-house company is legally independent of the HFP performance contract.

The performance contract for the HERKULES follow-on project, concluded on 28 December 2016, led to changes in the tasks that the HERKULES Special Organization provides for the customer. This contract is the cause of and basis for the future organisational structure of SO H. It was the customer's prime objective to ensure continuous operation. At the same time, the orderly (formal) completion of the current HERKULES prime contract had to be guaranteed. The future organisational structure of SO H, which is to be geared towards these tasks, is presented in the following.



Performance control of BWI – body structure

due to its status as "GmbH". This required the conclusion of a binding contract between the Bundeswehr and BWI in order to determine the future tasks of BWI. Branch H3.1 of BAAINBw worked out a draft for a corresponding performance contract for the HERKULES follow-on project (HFP PC). This article describes the main components But there are more tasks to be taken care of within HFP. The BWI 2020 corporate strategy was approved by State Secretary Dr. Suder and contains requirements for an amended HFP customer management (CM (amended)) that must be structurally fulfilled by SO H. In addition, modified/new roles and processes must be created and implemented so as to make the HFP's services more dynamic, for example by establishing an HFP requirements and portfolio management for the future. These tasks will also be addressed in the following. The article will close with the presentation of a few projects which are not only important in technological-economic terms but also in terms of politics and which the SO H has taken over in 2017 with the aim of continuation.

Ensuring Continuous IT Operation

Main component of the performance contract is BWI's obligation to keep up the continuous IT operation after 27 December 2016.

To put it simply, this refers to IT services that were already part of the HERKULES prime contract in 2006 as well as services that were added in the last ten years. This mainly concerns the areas support, wide area networks (WANBw), data processing centres, IT platforms, central services, standard application software product families (SASPF), and systems in use.

The HERKULES follow-on performance contract also includes services relating to so-called "third-party business". Those are IT services which were originally not part of the HERKULES prime contract but for which the Bundeswehr and BWI agreed that they shall be additionally provided within the HERKULES contract period.

Tasks in preparation of the modernisation of the Bundeswehr IT landscape are also performed in line with this performance contract. An example of that is the development of a strategy for the use of cloud technology in the Bundeswehr.

Additional operational services for the use of SASPF functionalities are part of the performance contract, and so are regulations relating to the creation of prerequisites for BWI acting as the IT system house of the Bundeswehr. BWI will yet not only be the IT system house of the Bundeswehr, it will also be the IT service center of the Federal Government, which means it will also be service provider for other federal ministries within the framework of the Federal Government IT consolidation.

Flexible Future with HERKULES

In contrast to the HERKULES environment we have seen so far, the future will be characterised by adaptability. The HERKULES prime contract was concluded in 2006 and contained specific services which had to be completed by BWI within the contract period. There was a price ceiling for this "full package". This whole system was relatively static and not open to innovations. The focus lay on creating a centralised IT operation in order to be able to provide specific IT services.

The "new" performance contract breaks up with these rigid systematics.

That is why the HERKULES follow-on project performance contract was explicitly conceived as an IT framework contract. Continuous further development of the current HERKULES operation is laid down in the contract. System description and wording of the contract will be under constant development and complemented by services that are to be re-provided or have been changed. The performance contract provides the prerequisites for continuous further development and adaptation of the IT to the requirements of the Bundeswehr and the technological state of the art. Due to the performance contract it is possible that comprehensive new and amended services of the IT area can be contracted by BWI, including operational,

Transferring Tasks with Service Certificates

conceptual, developmental, and

management services.

It is planned to use so-called service certificates for the ordering of services; they can be differentiated into two categories: IT planning certificates and IT service ordering certificates.

The IT planning certificates based on the performance contract are used when IT services are to be planned by BWI or when new services that require a certain amount of planning and support services are to be developed. When development of a service has been completed, it will be included in the service specifications of the performance contract and can then be ordered by using IT service ordering certificates. As customer the Federal Government is not obliged to agree on additional service certificates with BWI. If they do agree on service certificates, then those are part of the performance contract to be updated. Hence the performance contract does not only serve as the basis for determining the obligation for the provision of services by BWI; its "open" structure also is an important means for transferring further tasks to BWI.

HERKULES Special Organization Structures

Maintaining the know-how, if possible through personnel continuity and stable organisational structures, is vital for ensuring the continuous IT operation in the beginnings of the HFP. The reallocation of responsibilities should largely be avoided due to subsequent changes in interfaces and the resulting risks.



Involvement CM (amended)

Since a large portion of services of the new contract refers to maintaining the current IT operation, this amount of HERKULES tasks will also have to be taken care of in the future, especially in technical sectors. The new SO H structure will help ensure continuous IT operation in the beginnings of the HFP contract. Moreover, the new tasks that arise out of the HFP performance contract will have to be considered, if currently conceivable, in terms of initial capability.

Further tasks as well as the structure of the HFP management organisation will have to be introduced step by step as soon as the following is accomplished: creation of HFP contractor requirement and portfolio management at the BWI IT in 2017, detailed elaboration of HFP processes, both from the perspective of entrepreneur and partner, the upcoming restructuring measures of the Bundeswehr and BWI, and the extension of tasks for the BWI IT relating to planning, implementation and operation. A specific point in time for this follow-on structure cannot be given at the moment due to the above uncertainties. After a stable condition has been achieved on the part of both Bundeswehr and BWI, this can be expected to happen in the course of 2018.

The body structure of the HERKULES prime contract (see Figure1) has basically proven useful and shall be continued in accordance with the BWI 2020 strategy for performance control of BWI as a government-owned company. The first step will be to adjust it to the new tasks in the requirement and portfolio management as well as to the tighter interlinking between Bundeswehr and BWI. Over the next years it will be successively developed simultaneously with the structural changes in the Bundeswehr and the BWI and possible changes of IT services.

Amended HFP Customer Management

The transition of BWI to a government-owned company will turn it into the IT system house of the Bundeswehr. Its role as fullservice provider increasingly requires the provision of services relating to IT conceptualisation, IT development, IT project management, IT procurement, and IT training, in addition to a larger amount of operational IT services (e.g. from the area of "green" IT). The tasks newly transferred to BWI and the therefore necessary bundling of Bundeswehr IT system services is expected to result in higher productivity and more efficient control. Besides, this allows the Bundeswehr to concentrate on its core functions.

BWI, in its function as system house, will be the major IT service provider of the Bundeswehr and an integral part of the Bundeswehr IT system. The future closer collaboration between Bundeswehr and BWI in the Bundeswehr IT system will be based on a standardised, continuous process model with defined roles for joint IT service management. This means that BWI is involved in the entire life cycle of an IT service, which requires close cooperation between BWI and the Bundeswehr during all phases of Bundeswehr processes.

In order to control the contractually agreed services of BWI, an amended customer management [CM (amended.)] is to be established in accordance with the requirements of the BWI 2020 strategy. It coordinates the requirements of the Bundeswehr towards the BWI IT service provider in a binding manner and represents them to its customer support.CM (amended) is thus the central Bundeswehr interface to BWI which is solely responsible for the ordering of service modifications and service reporting. It takes care of the joint performance of IT service management tasks while taking into account the various responsibilities in the planning, implementation and in-service use phases as well as use and operation of Bundeswehr IT services. Figure 2 shows the involvement in the CM (amended) of the Bundeswehr Office for Defence Planning (labeled PlgAmtBw in the figure), BAAINBw, and the Bundeswehr Communication and Information Systems Command (FüUstgKdoBw in the figure).

Requirement and Portfolio Management

The crucial point will be the implementation of the requirement and portfolio management of the HERKULES follow-on project.

Requirement management will index, document and harmonise the received requirements. This includes controlling of the progress of work. Portfolio management matches these requirements with the service portfolio (in this case of BWI) and evaluates the dependencies between the requirements. If necessary, already existing services will be modified, new ones will be developed and old ones decommissioned. This is made possible by close cooperation with the Bundeswehr Capability Management.

The objective is to plan in a comprehensive and consistent manner so that BWI is able to efficiently implement all relevant Bundeswehr requirements regarding the provision of IT services. Also, it should be possible to order the provision of services by BWI on short notice. This is to ensure in the medium term that the Bundeswehr IT does not lag behind the civilian development any longer; instead, further developments and innovations shall be predicted and incorporated into the planning early on.

The Coordination Organization for the Adjustment of the Bundeswehr IT System to the New Bundeswehr Structure (KOINBw)



The continuous structure-related adjustments of the Bundeswehr have many implications relating to fundamental changes in the structure and the processes of the Federal Ministry of Defence (FMoD) and in the organisational area of the Bundeswehr. These implications have an immediate effect on the Bundeswehr IT system even down to workplace level.



IT resources plan

The Bundeswehr is in the midst of a continuous modification process that will continue throughout the upcoming years. Major subjects in this regard are the evaluation of the reorientation in the organisational areas, the measures of the Attractiveness Agenda, and the reversal in personnel trends. The agenda will include topics ranging from additional equipment, relocations, disbandments, setups, reorganisations, transfers

of commands, to renamings of agencies and units. At the same time other things have to be planned and implemented: location adjustments, measures in the context of refugee relief, and adjustments to the so-called "mixed IT" (e.g. operationally relevant, medical, and security relevant IT). Figure 4 provides an overview of the influences on the IT resources plan. Central coordination and planning is called for in order to fully consider all aspects of the adjustment of the Bundeswehr IT system to the continuous structural changes of the Bundeswehr. Changes (relocations, setups, and other organisational measures) are planned as well as bundled and implemented in a project by KOINBw in close cooperation with the corresponding agencies and facilities and the responsible IT coordination offices on the basis of the implementation planning of the organisational areas.

These structural adjustments of individual organisations within the HERKULES project ensure the continuous operation even after the HERKULES prime contract comes to an end. Apart from the HFP, several other projects are handled by SO H. They usually share at least operational interdependencies with the HFP. Division H2, for example, is responsible for the Bw document management and the GroupwareBw projects.

Bundeswehr Document Management – First Development Stage

The Bw document management project serves the purpose of implementing a document management system that is in line with the electronic administrative work organisational concept. It mainly functions as support for electronic processing and eFile, which is why it contains functional components that support these elements. Moreover, it also features functions for electronic cooperation (such as email, links to WiKi). The email function guarantees the involvement of users who are not part of the Bundeswehr document management project in the electronic processing without database access (eFile)

The Bundeswehr tasked CGI Deutschland Ltd. & Co. KG with the development of a special Bundeswehr document management application, which was completed by the end of 2015. The application is based on their MS SharePoint 2013 eGovernment framework and was complemented by Bundeswehr-specific functions.

The hardware/software platform for the special Bw document management application is conceptualised within the framework of the HERKULES project and will be supplied and operated by the HERKULES follow-on project from 2017 onwards. The use of the Bw document management target solution is supposed to be guaranteed from the second quarter of 2017 until the end of 2017 in three lots, in the beginning for 15,000 employees in agencies on the first level of subordinate elements of the FMoD as well as in parts for the FMoD.

Electronic File (eFile)

This initiative is supposed to extend the circle of users of the Bw document management of the first development stage (15,000 users) with identical extent of functions to all employees working with this system. On the basis of 140,000 employees this would mean 125,00 further users. Moreover, a part of the users (e.g. Bundeswehr agencies abroad) needs to be considered as well. It needs to be checked in how far the increase in users calls for a separate project.

Bundeswehr Unified Collaboration Platform Groupware Bw

The objective of the Groupware project is the provision of a universally usable hardware and software basis (also for the increasingly important mobile work area with tablets, smartphones and other mobile devices) featuring basic functionalities and user interfaces. This hardware and software basis can then be used for specialty-based, functionoriented, and special functionalities for other projects.

All Bundeswehr personnel is supposed to be able to use functionalities that are, for example, necessary in the framework of the Bundeswehr document management. Access should be possible from the official IT workstation via the IT platform Groupware Bw at home, abroad, or on operations, completely independent of location and across different agencies.

Suggested solutions for the implementation of the requirements are being established at the moment. A selection of the solutions to be implemented can be expected for the end of the second quarter of 2017.

The takeover of the Bw document management project and the planned

takeover of the Groupware Bw project necessarily requires to ensure that personnel for risk management is available. Due to the high number of users (entire Bundeswehr), the mentioned projects in particular are of great technological-economic importance (complex technology, very large financial amounts), but they also reach deep into the structural and procedural processes of all agencies. In order for the projects to be successful, it must be ensured by increasing transparency that the Bundeswehr users accept the new systems, and extensive user trainings must be provided.

Conclusion

BWI will remain the IT service provider of the Bundeswehr. It has been acting as a government-owned company since 28 December 2016. BWI is established as the IT system house of the Bundeswehr and will be the federal IT service center, which means that it will also be able to provide IT services to other federal ministries. The performance contract concluded with BWI provides the prerequisites for continuous further development and adaptation of the IT to the technological state of the art. Implementation and further development of the presented projects are also guaranteed.



Complex Services/Purchasing Directorate (E)

The "moderate realignment" process within the Federal Office of Bundeswehr Equipment, Information Technology and In-Service Support (BAAINBw) aims at sustainably enhancing the ability to evaluate and control the project and product portfolio for which the organisation is responsible.

This also encompasses the areas of Complex Services (KDL) and the Bundeswehr Purchasing Process (EinkaufBw). Directorate E was further developed through the integration of the work organisation responsible for the projects of clothing, vehicle fleet service and army maintenance logistics (PrOFHI), which had been temporarily founded at BAA-INBw in June 2014. It was integrated into Directorate E as of 1 July 2016. The Directorate is based in Lahnstein and Koblenz.

The Tasks of Directorate E within BAAINBw

In fulfilling its tasks Directorate E is now working on all three pillars of the procurement and in-service process:

1. Procurement of materiel solutions i.a.w. the Customer Product Management (amended) (CPM nov.) procedure;

2. Bundeswehr Purchasing – non-project procurement; and

3. Satisfaction of demand via Complex Services (KDL).

Bundeswehr Purchasing (EinkaufBw) – Divisions E1 and E2

To maintain the operability of the Bundeswehr during missions, exercises and routine duty, Bundeswehr Purchasing covers what is called non-project procurement - i.e. the procurement of both offthe-shelf and Bundeswehr-specific supplies and equipment – according to a novel and comprehensive approach. Procurement by Bundeswehr Purchasing also encompasses the satisfaction of demand for follow-on spare parts for weapon systems/equipment during their in-service use phase. These requirements are satisfied through international and interdepartmental procurement. A wide spectrum of different supply items is procured - the number amounts to roughly 2 million, of which 500,000 are

purchased regularly. The items purchased range from small, i.e. off-the-shelf parts, such as screws, nuts and gaskets, to specific material for hardware and complex weapon systems.

Bundeswehr Purchasing has established

Federal Ministry of Defence. It is at that level that the framework for Bundeswehr Purchasing is set, purchasing strategies are adopted and policies are set. Directorate E's director at BAAINBw is responsible for managing purchases.

The Bundeswehr Purchasing system is structured according to "material segments", which are categorised according to the eCl@ss classification system. The material segments constitute clusters of supply items which are procured on the same markets. This procedure is common in the private sector as well. The organisational structure of Divisions E1 and E2 mirrors this logic.

The implementation of the strategic purchasing process is planned to be carried out systematically in three phases until the end of 2017. By 31 December 2013, three



The three pillars of the procurement and in-service process and their interaction

an economically optimised process for satisfying materiel requirements using modern methods, following a comprehensive Bundeswehr-wide approach, and clearly assigning responsibilities.

These are its core principles:

 A strategic method of work including a centralised and overarching command and control process;

 Stringent material segment management oriented towards the procurement market and in close coordination with the requesting authority; and

– A process-oriented organisational structure.

By implementing Bundeswehr Purchasing, a strategic tier of procurement has been added to the current, mostly operative tier represented by the procuring agencies. The intention is to ensure an optimised and comprehensive purchasing process. The overall responsibility for the Purchasing Process lies with Division A III at the pilot material segments – vehicle technology, office supplies and medical technology – had been introduced. The first implementation phase of Bundeswehr Purchasing was thereby largely completed.

For instance, instead of frequently inviting one-off tenders in order to satisfy recurring small-scale demands, BAAINBw now concludes multiple-delivery contracts with a term of up to three years.

Switching to the use of recycled paper made an essential contribution towards implementing the Federal Government's "Sustainability Measures Programme". This serves to achieve the set goals aimed at promoting sustainable development in the agencies and institutions of the federal administration. Recently, the use of recycled paper has been increased again and now attains almost 90%. This means that the Bundeswehr has almost reached the target set by the Sustainability Measures Programme. Bundeswehr Purchasing had put in an appearance at the 2nd Bundeswehr Day in Trier in 2016 with an information stand on the topic of "Illuminants for the Bundeswehr and the Federal Government". The main theme was the practical implementation of sustainability requirements in the material segment of electrical engineering. In 2016, BAAINBw concluded an interdepartmental infinite-quantity contract on the direct delivery of individual expendable supplies in the "illuminants" product group. Within the framework of this contract, Bundeswehr agencies and all other federal ministries can order more than 400 different items. 130 items in the interdepartmental contract alone belong to the group of light-emitting diodes or LED lamps. Therefore, implementing one procurement process across all federal agencies makes it possible to replace conventional illuminants (e.g. neon lamps) with modern LED lights in a cost-efficient manner and to simultaneously reduce the energy consumption of light sources by somewhere in the order of 70-80%. At the same time, the Bundeswehr contributes to environmental protection by reducing CO2 emissions (calculation of reductions assuming 5,000 LED lights ordered per year: CO2 emissions (in t CO2e) 211.8 t/annum, energy consumption (in toe) 32.0 toe/annum).

The second implementation phase - Optimised Bundeswehr Purchasing - could be partially completed by 31 December 2015. The following material segments were transferred into the Bundeswehr Purchasing Process: electrical engineering; automation engineering; process control engineering; housekeeping; housekeeping technology; foodstuffs; beverages; tobacco products; energy; extraction products; recycling products and residues; the partial segments grid-based energy sources (ZEE) and POL (petrol; oil lubricants); and the information, communication and media technologies material segment. After having completed the second implementation phase, the main focus was on optimising the quality and availability of data. In order to standardise and professionalise Bundeswehr Purchasing, data on creditors and the framework contracts that had so far been managed in a decentralised manner was now transferred to a central data management system. As a result, information on the framework contracts is now available to procurement agents in the entire Bundeswehr in a common framework contract database. However, collecting, maintaining and displaying data related to the interdepartmental infinite-quantity contracts at item level with the help of the SASPF software (short for Standard Application Software Product Family) remains the main objective.

On top of that, more material segments (e.g. machine parts, fastener hardware, fittings, packaging material) are continuously transferred into the new, revised purchasing process. During the third and last phase of implementation, the Bundeswehr Purchasing Process is supposed to be implemented in all material segments from 2017 onwards.

Division E1 at BAAINBw is responsible for concept design and for continuously developing the Bundeswehr Purchasing Process.

The "moderate realignment" process also led to a restructuring of Division E2. This constituted another step forward in the continuous development of the Bundeswehr Purchasing Process.

Within this process, Division E2 performs both strategic and operative tasks at the level of individual material segments. The transferred material segments are now bundled in that branch. For the first time now, the strategic "tools" needed for the development of the operative procurement activities in the majority of material segments have been concentrated in one organisational unit.

The strategic tasks bundled in Branch E2.4 concern material segments that are subject to specific requirements and which require additional expertise. This category encompasses medicine/medical technology and closely related material segments such as laboratory material & technology. The number of staff positions dedicated to strategic activities was increased in that area as well.

The graphic below illustrates the strategic task process up to the point when the contract award strategy has been determined. Both branches have the authority to conclude strategic contracts. Building up the contracting authority of Branch E2.1 goes hand in hand with building up "strategic



Sustainability case study: the use of recycled paper

division is therefore structured into different material segments based on the eCl@ ss classification.

This enables the division to conduct targeted searches for required supplies and equipment on the procurement markets by developing and implementing specific procurement strategies for each material segment. Each material segment is spearheaded by a Material Segment Manager. They have directive authority across the boundaries of the major organisational elements. Support provided by procurement experts in specific material segments facilitates a common procurement process throughout the Bundeswehr and for the individual segments. This, in turn, leads to pooling and synergy effects.

The strategic pooling of tasks in Branch E2.1 is one of the major innovations. Strategic tasks for the majority of already

competence".

Besides the strategic activities mentioned above, Branch E2.4 is also responsible for strategic contracting (standard and interdepartmental indefinite-quantity contracts) in the POL material segment. In his or her function as Purchasing Manager, the Director of Directorate E yields technical authority across organisational boundaries. The Director is therefore superior to all other officials at agency level and can, if necessary, request them to adjust their material segment planning.

Operative tasks are concentrated within Branches E2.2 and E2.3. They deal with the actual procurement of goods. Essentially, this encompasses the following tasks:

 Implementing the procurement strategies and standards in case any have been set;



Bundeswehr Purchasing information stand at the Bundeswehr Day on 11 June 2016

- Carrying out the public contract award process;
- Order processing;
- Checking deliveries and invoices;

• Carrying out monetary transactions. These two branches are responsible for procuring almost all follow-on spare parts for in-service weapon systems/hardware that are required by the forces. A considerable share of the contracts is tendered competitively and with SMEs taking part in the process.

In future, the procedures of operative procurement will be developed further by continually optimising the Bundeswehr Purchasing Process. This can be achieved, for instance, by further increasing the number of infinite-quantity contracts that are initiated via material segment planning. The purpose is to use the available resources ever better.

Complex Services – Division E3

Public-private partnerships (PPP) and Complex Services (KDL) constitute the third pillar of the equipment and in-service process.

The "Bundeswehr Complex Services Concept", drawn up on 1 August 2014, serves as the definitive policy document for this third pillar.

Within the context of the "moderate realignment of BAAINBw", the structure of Directorate E was adapted to the current requirements on 1 July 2016.

The directorate's structure is now as follows: Branch E3.1 develops project strategies for complex services projects, works out the performance process, develops it further and supports the evaluation and statistics phase of complex services projects. On top of that, Branch E3.1 supports the other branches within the remit of Division E in all common and policy tasks related to project management, the project management responsibilities for complex services of which Directorate E is in charge. These include:

- Bundeswehr Vehicle Fleet Service System (System BwFPS): meeting the mobility requirements of the Bundeswehr with the help of commercial, unprotected vehicles;
- Army Maintenance Logistics (HIL): complex maintenance services for entire Bundeswehr land systems;
- Package 1 CBRN supplies: supply management of the Bundeswehr's individual CBRN protective equipment and clothing;
- Package 2 CBRN supplies: supply management of both common and weapon system-specific material for Bundeswehr CBRN defence;
- Central Bundeswehr Spare Parts Logistics (ZEBEL): supplying civilian and selected military maintenance facilities with government-owned spare parts via a private service provider;
- Clothing management (supplying Bundeswehr soldiers and civilian employees with clothing and personal equipment).

Branches E3.2 through E3.4 have been set up as organisational elements for the project management of complex services projects, taking both technical-logistic and overall control of the aforementioned projects. Projects for complex services are systematically controlled and/ or developed further in these branches.



Strategic planning cycle

implementation and documentation of efficiency analyses, the creation of statements of work, and during expressionof-interest procedures.

Branches E3.2 through E3.4 take on

Integrated project teams provide the framework for interdisciplinary cooperation across organisational boundaries. They contribute significantly to the success of the project work. The objective always is to develop customised capabilities for our forces in a timely manner and in collaboration with private sector companies while at the same time complying with the legal framework conditions and providing cost-effective solutions.

Branches E3.5 and E3.6 are responsible for processing contracts, dealing with issues related to contract award law and negotiating prices for the projects.

Also, Branch E3.6 is in charge of processing and awarding contracts related to transportation in the Bundeswehr (for the modes of transport road, rail, air and sea). It took over these responsibilities from the Federal Office of Bundeswehr Infrastructure, Environmental Protection and Services (BAIUDBw) in January 2013. As such, Branch E3.6 is the central contracting authority ensuring that the demands for transportation in the Bundeswehr are met both during routine duty (including exercises) and during missions.

In that context, their area of activities also extends to processing cases of impaired contract performance (transport damage).

As a result, both the project management and the legal and economic expertise related to complex services are concentrated in one division. Therefore, both the juridical-economic and the top-level technicaleconomic elements can be offered from a single source in order to be better able to use potentials for optimisation.

In the following paragraphs, the branches' diverse tasks are explained using the example of the Bundeswehr Vehicle Fleet Service (BwFPS) project. That project meets the mobility requirements of the Bundeswehr in a cost-effective manner by offering commercial, unprotected vehicles. In order to achieve this, the company BundeswehrFuhrpark Service GmbH (BwFPS GmbH) offers a range of services stipulated by contract. BwFPS GmbH is a hundredpercent in-house company. 75.1% of its shares are held by the Federal Ministry of Defence (BMVg), 24.9% by Deutsche Bahn AG (DB AG). The services offered by BwFPS GmbH include the provision of commercial vehicles, commercial special-duty vehicles, commercial vehicles with special military equipment as well as services.

The tasks performed by BAAINBw are aimed at coordinating the overall responsibility for the system and at optimising and developing further the BwFPS system. The objectives are as follows:

- Optimising and further developing the system;
- Enabling BwFPS GmbH to provide services to the Bundeswehr more efficiently;

• Providing vehicles and services more cost-effectively in both the short and long term.

BwFPS GmbH deals with a wide spectrum of routine-duty tasks. They include budgeting, risk management, regularly updating FMoD on current developments, responding to system-related queries and supporting the project directorate that has the technical responsibility.

The contract setting out the BwFPS follow-on solution entered into force on 1 July 2016. It combines the three framework contracts which had existed up to that point (on the provision of commercial vehicles, the provision of vehicles with special military equipment and driver training vehicles, and the build-up and operation of a central vehicle management, respectively) into a single framework contract. Another innovation of the BwFPS follow-on solution is that it is unlimited in time. This provides predictability in planning and makes it possible to plan and implement optimisation measures over an extended time period. In order to maintain GmbH provided services in a cost-efficient manner and tailored to the demand to highlight existing potentials for optimisation. On top of this, the follow-on solution led to the implementation of the data and supply management system for commercial and partly militarisedBundeswehr end-of-life vehicles (DBM in short). Its main purpose is to support the regeneration of Bundeswehr end-of-life vehicles.

Conclusion

Branches have been reshuffled and assigned to different directorates. Even so, Directorate E will continue to be responsible for a heterogeneous range of tasks in future:

- Bundeswehr Purchasing
- Satisfaction of demand via Complex Services
- Procurement of product and service solutions i.a.w. the Customer Product Management (amended) procedure

In performing all of these tasks, the main focus is being put on making a cutting-



The service portfolio of BwFPS GmbH

a constant incentive to innovate, a new instrument with the name of "Continuous Outcome Monitoring" (KontinuierlicheErgebniskontrolle – KEK) was created. It serves to evaluate whether BwFPS edge contribution to achieving the ultimate goal of armaments management: providing task-tailored equipment and professional services to the entire Bundeswehr.

"Central Affairs" Directorate (ZA)

The Central Affairs Directorate (Directorate ZA) was established on 1 July 2017. Being considerably streamlined, it has assumed the core tasks of the former Z Directorate and focuses on the administrative tasks of BAAINBw.

The newly established ZA Directorate is subdivided into four divisions with a total of 18 branches and the ZA Directorate Office.

The task areas of Division ZA1 encompass organisational structure/organisational procedures, process organisation in the organisational area of equipment, information technology and in-service support (AIN) as well as personnel and materiel safety affairs. The Technical Information Center also belongs to the ZA1 Division.

As regards its structure and distribution of tasks the ZA2 Division "Finance" with its five branches is characterised by the special tasks of BAAINBw. It is responsible for the administration of investments in the amount of approx. 6.2 billion €, of approx. 3.2 billion € for materiel maintenance and approx. 1.6 billion \in for operation and titles. What is new is that the division has assumed the task of providing input to the financial requirements analysis (FBA) for the preparation of financial planning concerning future procurement budgets.

BAAINBw is not only a major procurement agency of the Federal Republic of Germany and thus an important public customer, but has also had materiel responsibility for the initial operational capability of the defence materiel since 2012. The ZA2 Division administers the required budgetary funds required for this purpose.

New paths are being taken by the ZA3 Division. This division focuses mainly on requesting agency-related activities for personnel of the agency. What is new is that basic and advanced training affairs of civilian and military personnel that were separated in previous branches have now been combined.

Main tasks of the ZA4 Division are:

- Assist and support personnel with regard to matters of IT and IT security;
- Handle infrastructure affairs of the AIN organisation;

 Internal services including the following tasks: Support of the motor pool, contract point to the BundeswehrFuhrparkService (LLC responsible for vehicle fleet management and the provision of motor pool services for the Bundeswehr (BwFPS)), logistics and materiel sup-

ply for the federal office and BAA-INBw activities in representation of the user (e.g. real estate, accommodation and garrison affairs) in Koblenz, Lahnstein and Bonn as well as Proparation of print and bindory iobs

 Preparation of print and bindery jobs and conduct of postal, registry and messenger services of BAAINBw.



Directorate T "Technical, Logistic and Economic Activities"

In the course of the organisational further development of BAAINBw, Directorate T "Technical, logistic and economic activities" was established on 1 July 2017.

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This Directorate merges the fields of work of international cooperation and

agreements, matters of missions and exercises, defence materiel of other nations, overall R&T coordination, product-specific protection tasks, technical ergonomics, disposal of Bundeswehr materiel, the Scientific Collection of Defense Engineering Specimens, the Cost Competence Center, price audit and common tasks regarding equipment, in-service use and logistics.

Organigramm

Division T1 works on a wideranging and common task portfolio on international level.

Branch T1.1 is responsible for administrative and equipment assistance tasks as the supplying agency, enhancement programmes and contracts for recycling and disposal.

T1.2 deals with project-specific international departmental agreements and foreign military sales.

Branch T1.3 coordinates and controls international cooperation in the field of common defence technological cooperation in the sphere of responsibility of BAAINBw and standardisation in the organisational element of Equipment, Information Technology and In-Service Use.

The main tasks of Branch T1.4 are coordinating and controlling the procurement of mission-essential and urgent requirements, of mission and exercise matters and evaluating experiences with defence materiel gained in Bundeswehr missions abroad. T1.5 coordinates all activities of BAAINBw and the subordinate agencies in the field of defence materiel research and technology and the evaluation of foreign defence materiel.

Branch T1.6 deals with the topics of modelling & simulation, CD&E, M&S policy and technologies and is respon-

sible for the R&T working area "information collection, system Bw".

In **Division T2**, the Branches T2.1 to T2.4 essentially consult project managers and thus see to it that regarding realisation, introduction and in-service use of defence materiel, the system-specific protective tasks, which



are derived from the legal and non-legal protective tasks, are implemented. Therefore, as a matter of principle, the German Occupational Health and Safety Regulations also apply to the workplaces of soldiers during routine operations and deployments as well as to the civilian personnel carrying out trials or performance tests. Bundeswehr personnel are thus entitled to health protection at the workplace and to humane working conditions in the same way as employees working in trade and industry.

Also, Bundeswehr weapon systems must not have any adverse impacts on the environment.

Besides the classic responsibilities, the focus is also increasingly on the areas of "functional safety and software security" when assessing system safety and security due to the strong dominance of intelligent system shares in the weapon systems of the Bundeswehr.

Branch T2.5 is responsible for the disposal of Bundeswehr materiel. They deal with the handover, free of charge or against payment, of discarded materiel or material which will not be needed in the foreseeable future, to agencies outside the Bundeswehr.

The Scientific Collection of Defense Engineering Specimens (T2.6) has an exhibition space of 7,200 sqm and is thus one of the large technically-oriented collections in the Federal Republic of Germany. It was founded in 1962 and since 1982 it has been situated in Koblenz, the main BAA-INBw location. Its tasks are documenting the technological development of defence materiel, cooperating in initial and extension training of defence engineers and technicians, informing the people employed at the Bundeswehr and the public, supporting the recruiting campaign and cooperating in the Bundeswehr network of museums and collections.

DivisionT3 is divided into the following Branches: Price Auditing / Cost Competence Center (T3.1) Price Auditing Policy / Common Price Auditing (T3.2), Price Auditing Airframe / Engine (T3.3), Price Auditing Materiel Maintenance, Missiles, Other Aeronautical Equipment (T3.4), Price Auditing Electronics, Sensor Systems (T3.5) and Price Auditing Weapons and Ammunitions, Wheeled and Tracked Vehicles, Ships and Vessels (T3.6).

The tasks of Division T3 result from the BAAINBw's commitment to an economic project implementation and to agreeing upon reasonable prices in accordance with the guidelines on pricing and contract award.

The Cost Competence Center, T3.1, primarily supports the economic execution and implementation of projects and organisational measures in all phases of the (amended) CPM procedure by means of parametric cost estimates, cost-effectiveness evaluations, assessments of alternative forms of procurement and review and staffing of phase documents. In special cases, additional value engineering is conducted outside of the CPM. Furthermore, T3.1 is the Office's central point of contact for matters regarding life cycle cost management. On request, the Cost Competence Center also gives presentations on the described topics. The tasks of Branch T3.2 range from central contract control and price audits to dealing with requests regarding fundamental aspects of pricing legislation, business administration and cost audits, developing work instructions and guidelines for the BAAINBw price audit Branches and price negotiations, model contract price and cost arrangements to cooperation with the pricing agencies of the German states, support to multinational organisations and NATO programme offices and official assistance for foreign governments.

The operative price audit Branches T3.3 to T3.6 technically and economically evaluate, in accordance with price law, whether cost prices are appropriate. For this evaluation they use detailed cost data and documents and assess the estimated quantities and cost.

The main focus of Division T4 is the support of the BAAINBw project directorates in managing the logistics project element in all the defence materiel phases. T4 is the link to the Bundeswehr Logistics Command and as such is the key provider as regards the implementation of logistic processes.

Branch T4.1 deals with fundamental tasks of equipment, in-service support and logistics and provides specialist support to projects regarding the logistics project element (T4.1).

Branch T4.2 is responsible for the operational support of the project directorates in materiel management and disposal of defence materiel (materiel disposal officer). Branch T4.3 supports the project managers in the areas of codification and requesting materiel planning designations.

Branch T4.4 is responsible for the operational support of the subordinate agencies of BAAINBw (Bundeswehr technical centers and Bundeswehr research institutes) regarding their logistic tasks in contract management, materiel management, maintenance and equipment planning.

In the fields of import, export and transport, T4 is also in charge of end-use control and the Documentation Center for Loans within the organisational area of Equipment, Information Technology and In-Service Use (T4.5).



Mark your diary: Brussels, 23/24 January 2018 14th NATO Life Cycle Management Conference

MITTLER REPORT

LCM as a Joint Effort -Perspectives and Objectives for NATO, Major Industries and SMEs

Chaired by: Thomas E. Pedersen and J. Bo Leimand (ret), Danish Defence Acquisition and Logistics Organisation (DALO)

The annual NATO LCM Conference will continue to consider the lessons learned and achievements made in areas such as Quality Assurance, Life Cycle Costing, Configuration Management, Acquisition Practices, Material Maintainability et al. as a basis for new and innovative, even disruptive approaches and perspectives which will be introduced in respective presentations. The event will again be organised in cooperation with the NATO Life Cycle Management Group (AC/327) and with the support of the NATO Industrial Advisory Group (NIAG) and the German CALS Forum. The conference will be combined with a small exhibition to showcase respective capabilities and will take place at the Parker Hotel Brussels Airport (formerly: Golden Tulip) on 23/24 January 2018.

Contributing Organisations: NSPA, SSM (Turkish MoD), NETMA, FFI, UK MoD, Airbus Defence & Space, Leonardo, QinetiQ, Ukroboronprom (tbc), KPMG, T-Systems, Systecon et.al.

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Technical Quality Management Center (ZtQ)

The status of the Technical Quality Management Center (ZtQ), acting as the Bundeswehr quality assurance authority, has risen considerably. This has two reasons. First, it plays a central role regarding product quality. Second, the Bundeswehr as an employer has a special responsibility vis-à-vis its servicemen and women to ensure functional readiness and operational safety. The Technical Quality Management Center complements the work of the cross-sectional directorates ZA (Central Affairs) and T (Common Technical, Logistic and Economic Activities) in technical matters, particularly in dealing with contractors and external actors in general. ZtQ is an independent directorate and directly assigned to the Director-General. It is not bound by instructions when giving technical expert opinions.

n 2016, the organisational structures and procedures of the Federal Office of Bundeswehr Equipment, Information Technology and In-Service Support (BAAINBw) were readjusted. Within this process, both operative and regulatory activities were bundled in the new Technical Quality Management Center. Its operative activities involve contract-based monitoring of contractors' quality assurance measures. The regulatory activities (also known as quality requirements management) underpin technical quality management.

Treading New Paths

The Technical Quality Management Center emerged from BAAINBw's former Division Q2. The fact that it was created in

the prominent organisational form of a 'centre' underlines the growing importance of quality planning, control and assurance in both the procurement and the in-service processes and also vis-à-vis contractors. That form of organisation also strengthens its independence from project divisions when performing its role as a quality assurance instrument for the Director-General regarding industry contracts.

A Risk-Based Approach

The Technical Quality Management Center will be more flexible and targeted in its activities and increasingly hold contractual partners or prime contractors (as well as dealers) to account. In doing so, it follows a risk-based approach by concentrating the quality assurance resources on such projects in which the quality assurance activities carried out by the contractor fail to inspire the trust of the public authorities. It



is mandatory to follow a tiered sequence of tests, ranging from simple audits to hundred-percent inspections of parts carried out by the public authorities.

This underlines the point that market participants who contractually guarantee to provide products or services with certain properties have to take responsibility at all times for ensuring that these properties are in substance delivered. Technical quality assurance is thus linked both to what is called (pre)contractual quality assurance and to quality assurance within individual projects. By the time a contract is concluded, quality assurance has to ensure that:

 within the context of requirements management unambiguous, weighted, realistic and measurable requirements are determined for both the product and the contractor (cf. pre-qualification); and that
 insufficient performance may be sanctioned systematically.

Improved Organisation

The Technical Quality Management Center has four divisions. In matters related to government quality assurance, Division ZtQ1 has power of direction within the remit of the Federal Ministry of Defence. Its staff consists of government quality assurance officers who work on current and upcoming projects. They are particularly involved in the pre-contract phase and collaborate with the project teams to ensure that unambiguous and verifiable test and acceptance criteria are determined. Also, they determine the contractual quality assurance requirements. More than 130 qualified auditors are on hand to check the quality capability of (future) tendering companies and to verify whether potential future contractors fulfil pre-qualification requirements. In addition, ZtQ1 is the agency responsible for processing requests for gov-



Pre-contract analysis of requirements and project-related risks is the basis for successful contract implementation.



Quality assurance inspectors being trained on a foreign kamikaze drone (non-Bundeswehr)

vesting when it comes to major projects funded with taxpayer money. The Technical Quality Management Center has already developed an idea on the matter which needs both long-term and political support in order to be successful.

Quality Control Teams

In order to make sure that the Technical Quality Management Center's regional offices (known as Bundeswehr quality assurance offices) are better controlled, three additional divisions were created. They group the regional offices into districts, the headquarters of which are based in Hamburg (north), Kassel (central Germany) and Manching (south) respectively. In case relations with contractual partners escalate, the district managers help to advance legitimate contractual interests. Initially, government quality assurance inspectors perform this role at the contractors'. It is them who support the project managers in the field in enforcing contract requirements.

The Bundeswehr Quality Assurance rests on three pillars: first, the core responsibility of the organisational area AIN (Equipment, Information Technology and In-Service Support) for the functional readiness and operational safety of military products within the remit of the Federal Ministry of Defense (BMVg); second, the Bundeswehr's obligation as an employer to provide care and welfare services to its servicemen and women; third, the budgetary principle of cost-effectiveness. Even though third parties (e.g. external inspection organisations) can be called upon to assist, quality assurance as such may not be divided up or delegated.

ernment quality assurance inspections made by international allies who have concluded defence contracts with German firms. The Bundeswehr quality assurance authorities are also renowned internationally for their high professional competence, which is recognized abroad to provide a competitive advantage. Big corporations or major public sector projects that are insufficiently monitored by authorities but still operate according to the imperatives of maximum profits or efficiency are being more and more overtly criticised by European partners. It is therefore high time to put serious thought into a new seal of quality for government quality assurance in complex public sector projects. This would serve to restore the trust of both citizens and foreign stakeholders interested in in-



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Legal Affairs Staff Element

In December 2015, the organisational readjustments started in the Federal Office of Bundeswehr Equipment, Information Technology and In-Service Support (BAAINBw). With effect from 1 April 2017, the Legal Affairs Department, now being a Staff element, has been established in proximity to the executive level.

The Legal Affairs Department basically evolved from the previous BAAINBw division Z3 and is now subdivided into the Branches J1 (procurement law), J2 (contract law policy) and J3 (intellectual property rights).

An essential workshare of all Branches of Staff J is the quality assurance in projects with an estimated contract value of over 25 million Euros (so-called major projects). The project divisions continuously involve Staff J from an early stage on. The initial cooperation of the contract departments with the Legal Affairs Department already begins with the decision on the contract award procedure. In the further course, the complete contract award documents (including the draft contract and the statement of work) are mutually agreed upon and the final contract will be co-reviewed. This continuous integration of Staff J guarantees an even knowledge distribution of overarching topics between the contract departments and Staff J, but also between the contract departments among each other.

Besides this wide area which connects all Branches, each Branch has its independent basic task.

Branch J1

Branch J1 is responsible for all general matters regarding the procurement law.

Part of this is advice on the procurement law for the project Directorates and the BAAIN-Bw executive group as well as processing of the BAAINBw Procurement Procedure Work Instruction and appropriate forms and the decision on the award procedure.

A further important aspect in Branch J1's work is the reverification procedures concerning BAAINBW. Here, points of main effort are the co-review of contract award reprimands and the proceedings before the public procurement complaint board and the higher regional court and the examination of other award procedures regarding their relevance for BAAINBW.

In addition, Branch J1 has the concurrent supervision under procurement law of government holding operations and supports the BAAINBw representative for competition and medium-sized companies.

Branch J2

Branch J2 is responsible for contract law policy matters.

Besides contract counselling for the individual contract branches in the field of civil law, J2's policy development work especially involves the continuous updating of draft contracts for contracts with an estimated contract value under €25 million. In order



Intellectual Property Rights (IPR), Copyright (Right of Use), License Agreements, Contract Law Related QA for Large-Scale Projects Regarding IPR and Technology

to be able to provide dependable draft contracts, which are accepted by industry, to the contract branches as assistance, there are regular consultations with industrial associations.

In the context of contract quality assurance in major projects, Branch J2, apart from continuously accompanying these contracts, also has the task of legally maintaining the IT (especially the SAP Contract

Lifecycle Management (CLM) program), supporting the contract management and of permanently checking and updating the clause library. These activities also involve in-house trainings. Further activities of Branch J2 are managing legal disputes in the pre-proceeding and proceeding states and insolvency proceedings.

Branch J3

Branch J3 is responsible for the functional area of Intellectual Property Rights (IPR).

In this connection, the Branch provides advice on user rights regulations in contracts in individual cases and also especially in the context of quality assurance in major projects. These are, among others, regulations in the field of copyright, software, proprietary rights and/or technical knowhow.

Other tasks of Branch J3 are managing industrial property rights cases and the employee invention law. This includes commercial patent, utility model, trademark and design applications, and also the respective previous tests and research work.

Apart from that, the Branch provides technical advice for drawing up and checking technical specifications during which the focus is essentially on requirements management which conforms to the awarding and contracting regulations and a precisely defined terminology.

The BAAINBw Agencies

In order to fulfil its highly complex tasks, the BAAINBw project management has to rely on defence technology and defence science studies, testing and market analyses. This technical support is provided by six Technical Centers and two Research Institutes. The Navy Arsenal and the German Liaison Office for Defense Materiel U.S.A./Canada also contribute significantly to fulfilling the task.

Bundeswehr Technical Center for Land-Based Vehicle Systems, Engineer and General Field Equipment (WTD 41)

The Bundeswehr has combined its specialist competence and spectrum of services as regards the testing of vehicles, mobile equipment and their components under the roof of the Bundeswehr Technical Center for Land-Based Vehicle Systems, Engineer and General Field Equipment (WTD 41) in Trier. Thanks to its personnel and its unique infrastructure WTD 41 has what it takes to execute and evaluate trials of ground vehicles and their components independently.

Activities and Core Capabilities

As regards the capabilities, particular emphasis is placed on the systems engineering analyses of prototypes and series production vehicles. These analyses serve to determine whether the contractually agreed functional services as well as other services in the field of vehicle technology have been rendered by the contractor and to point out where possible weak points with regard to inservice use are or where they must be expected.

The capability spectrum encompasses the following trials/tests/compliance demonstrations:

- Function and performance of vehicles and equipment
- Driving safety and driving stability tests
- Determination of weak points with regard to vehicles, equipment or assemblies by conducting fatigue tests
- Ergonomic assessments
- Acoustic tests of vehicles and equipment
- Electrical power engineering.

Another emphasis lies on the official analysis of assemblies and components of ground vehicles and Army equipment as well as batteries of all types for the Army, Air Force and Navy.

In addition to real driving tests and the operation of various test stands and laboratories, WTD 41 answers many vehicle-



related technical questions also virtually by computer simulation.

By combining armaments and in-service use tasks in the organisational area of equipment, information technology and in-service use, WTD 41 also performs the following tasks:

- Project management/in-service support management for special vehicles (mobile fuelling equipment, engineer equipment etc.)
- Preparing statements of work for the repair of protected vehicles and transmissions as well as updating technical specifications for assemblies
- Evaluating maintenance instructions of external companies pertaining to vehicles and/or assemblies.
- In the field of research and technology WTD 41 currently carries out tasks relating to:
- Propulsion systems and next generation chassis components
- Energy supply and renewables
- Smart vehicle electrical systems
- Unmanned ground systems, including vision systems

- Electromobility
- Vehicle diagnosis and communication.

Further Development of the Test Methodology

As regards driving tests it is state of the art to use so-called "synthetic" test tracks that make it possible to generate reproducible loads. WTD 41 has a number of such tracks. By combining synthetic test tracks and computer-assisted simulation the times and costs of driving tests are being optimised. The accelerated load thus exerted on the vehicles and their components correlates with real tracks under real operational conditions and is also confirmed by identical damage patterns which occur during testing and on operations. Supplementing real driving tests with simulation will continue to help meet ever increasing demands on the quality of results gained from the testing of vehicles and on the cost-effective conduct of these tests.

Demands on the test tracks of the Technical Center also arise from the requirement that the Bundeswehr must have the capability to deploy worldwide. By means of special cross-country courses that generate a wide variety of loads in the chassis of military vehicles, WTD 41 is capable of conducting reproducible investigations. The reproducibility has been further increased by the use of driving robots. The infrastructure is continually adapted to changing technical requirements and operational conditions.

Technical Support

The technical support provided by WTD 41 ranges from the preparation of statements of work and specifications to the provision of technical expertise in assessing the performance of the contract up to and technology (R&T), the dual courses of study at the Bundeswehr universities are supported and interns who study at universities and universities of applied sciences are supervised. Moreover, candidates applying for the intermediate, higher intermediate and higher service regularly complete their training stations at WTD 41.

There are also interesting task areas as regards internships for high school students to provide young people with useful information about subsequent career choices. In this context, WTD 41 offers vocational training in the occupations "Kfz-Mechatroniker" (automotive mechatronics engineer) and "Elektroniker





Aerial photo of WTD 41

the standardisation of test procedures as a result of experiences gained in the past with vehicles, assemblies or equipment. Moreover, WTD 41 is capable of certifying assemblies, vehicle components or subsystems in accordance with German military standards (VG 96916-20: Electrical systems for land vehicles). The agency also approves spare parts provided by new suppliers and monitors prototype repairs.

Additional Tasks

Like other agencies within the organisational element of AIN (equipment, information technology and in-service support), WTD 41 is increasingly integrated into international cooperation projects which is mainly reflected in the exchange of defence engineers. The same applies to the broad task area of training: There are cooperations with universities and institutions in the field of research für Systeme und Geräte" (electrician for systems and equipment) with the participation of the German Chamber of Industry and Commerce (IHK).

Bundeswehr Technical Center for Protective and Special Technologies (WTD 52)

The core competences of WTD 52 are the fields of direct and indirect protection, both serving to safeguard survivability on the battlefield and including preventive defence measures against asymmetric threats. This includes:

- protection of infrastructure against asymmetric threats and ammunition storage safety
- numeric simulation
- indirect protection (camouflage, cocealment and deception)
- non-lethal weapons (NLW) and
- physical detection of improvised explosive devices (IED)

Special technologies include a variety of different topics that can be dealt with in an ideal manner due to a year-long build-up of competences and specific conditions of infrastructure prevailing at WTD 52. This includes:

- simulation of nuclear blast waves
- aerodynamic load tests
- mobile antenna supporting structures
- primary batteries with a high risk potential
- detection of landmines
- underwater testing

The infrastructure is largely characterised by the tasks of WTD 52 but also by its location in the south-eastern Bavarian Alps. WTD 52 benefits from particular geographic and geological conditions, some of which are unequalled in this combination worldwide. This is why WTD 52 is organised into three major infrastructural areas. Apart from the administrative, laboratory and office buildings located in the valley, which include proving facilities and workshops, there is an underground facility in the "Reiteralpe" massif, the Bundeswehr's own cableway, and there are alpine test sites and demolition ranges at an altitude of approximately 1,700 m, which altogether represent manifold opportunities for research and testing. The focus of the inspections on physical protection against terrorist attacks lay on tests to identify how different blast wall systems react to blast loads which occur during the detonation of several tons of explosives. This situation is relevant for all threat environments in which objects protected by blast walls, such as camps or buildings in an urban area, are exposed to a threat in the form of (M)VB-IEDs (Massive Vehicle Borne IED), meaning large vehicle bombs. The tests are accompanied by numerical calculations and are supposed to shed light on the following questions:

- What is the maximum load the wall can withstand?
- How wide is the area that has been destroyed, and is it hen possible for persons or even vehicles to break through the wall?
- What are the threats (posed by primary fragments, blast, secondary splinters etc.) for persons in the free field behind the wall?
- Does the wall have any residual value in terms of protection after possible failure, and if so, to what extent?
- To what height does the wall still provide visual protection after it has toppled or been destroyed?

The tests were conducted with the WTD 52's Large Blast Simulator (LBS) because it can create long-lasting blast loads spread out over large areas. They are in peak over-



FUCHS KAI at WTD 52

pressure and impulse comparable to those of the corresponding (M)VB-IED scenarios. Testing will reach its peak in 2018 with the international campaign called Super Heavy Improvised Explosive Loading Demonstration (SHIELD) in Älvdålen, Sweden. The objective of this campaign is to test the efficacy of the physical protective measures under the conditions of a real detonation of 30 tons of TNT.

During recent years, new asymmetric threat scenarios have gained more and more importance, also for the Bundeswehr. In this context, attacks are often being performed with booby traps and IEDs in order to inflict high losses on persons or material. Development has started on the DEU RCSys (German Route Clearance Systems) to counter this deadly threat to our armed forces. The DEU RCSys serves the purpose of reconnaissance and manipulation of mines and IEDs. It is currently comprised of a detection vehicle, an operator team vehicle, an explosive ordnance disposal robot (EOD robot), and a transport vehicle. The FUCHS armoured personnel and load carrier for explosive ordnance reconnaissance and identification (FUCHS KAI) is being realised at the moment as a supplement to the system.

The project authority BAAINBw K6.4 has instructed WTD 52 with the verification of the FUCHS KAI's detection component. This detection component, which is called dual sensor, is comprised of a metal detector and a soil penetration radar. The verification of the FUCHS KAI armoured carrier is slated to begin in January 2016. The FUCHS KAI armoured carrier was subjected to a weak point analysis before the verification process in order to identify potential performance deficits early on. As part of this weak point analysis, the FUCHS KAI armoured carrier was located at WTD 52 from 10 June 2016 to 3 August 2016. The on-site infrastructure at Oberjettenberg was used to test the performance of the dual sensor. This infrastructure, geared to the purposes of physically detecting IEDs, is composed of 6 test fields fitted with IED surrogates. The different soils on the test field are basalt, humus, laterite, loam, sand and gravel.

The findings from the weak point analysis of the FUCHS KAI armoured carrier at WTD 52 are used for the optimisation of the FUCHS KAI armoured carrier's detection component and for future developments.

Bundeswehr Technical Center for Aircraft and Aeronautical Equipment (WTD 61)

Located in the Bavarian town of Manching, the Bundeswehr Technical Center for Aircraft and Aeronautical Equipment (WTD 61) encompasses the strategic areas of technical system evaluation and aeronautical evaluation and compliance activities. It is the Bundeswehr's technical centre of excellence for aircraft and aeronautical equipment.

Maintaining and enhancing specialist and technical expertise are among the core tasks of the technical centre. Its purpose is to support the project managers at the Federal Office of Bundeswehr Equipment, Information Technology and In-Service Support (BAAINBw) in evaluating the results of industrial development and production in an objective and sound manner. In 2014, the Technical center transferred an important area of its activity, namely airworthiness verification and type certification, to the newly founded Bundeswehr Aviation Office. The Technical Center is facing new challenges as the areas of technical expertise and airworthiness verification/ type certification have been separated. The centre's divisions 400 (Overall Systems

The centre's divisions 400 (Overall Systems and Propulsion Systems) and 500 (Mission

Systems and Avionics) are the providers of specialist competence regarding the evaluation of aircraft and aeronautical equipment within the remit of BAAINBw. For important areas of activity, capability groups are established according to the projects' needs. Another core task is to deal with specifically military tasks such as air-to-air refuelling or delivery systems, as they cannot be covered by non-Bundeswehr organisations. Testing new sensor and communications technology and integrating new weapons and self-protection systems is another element of activity. Amongst other activities, electromagnetic compatibility (EMC) and signatures as well as system-oriented aspects of fuels and materials constitute special tasks. The Technical Center helps to build these up as core tasks within the Bundeswehr, in collaboration with other agencies and offices.

Division 300 (Flight Tests) has the official competence to independently evaluate and gualify aircraft and aeronautical equipment. This is especially true in those areas where no industrial capabilities exist or in which they are being cut back on a national level, as is the case for the integration of weapons into aircraft, for instance. Providing in-service support for all manned and unmanned systems is a core task of the Technical Center. Offering in-service support is a prerequisite for gaining official insights and maintaining flight test expertise. In order to maintain its capacity to evaluate and give advice independently, the centre has its own test aircraft crews for all types of aircraft that undergo testing. The overall responsibility for controlling, coordinating and evaluating flight tests carried out at the Technical Center lies with flight test engineers. The work of these engineers is essential for the entire test procedure. Similar to the crews, they have to undergo special training at an approved flight test school.

In the context of the processes related to the amended Customer Product Management (CPM (amended)), the agency mainly focuses on the phases of analysis and inservice support as well as on the area of research & technology. In future, WTD 61 will establish closer networks with the forces and both coordinate activities and intensify its cooperation with research institutes in order to make technologies ready for operational use faster. In this way, WTD 61 and the other Bundeswehr technical centers and research institutes contribute decisively to the preparation of selection decisions in procurement projects, and, by extension, to cost efficiency.

WTD 61 supports BAAINBw in all aircraft projects. It also assists the Bundeswehr Aviation Office with technical expertise in

airworthiness certification and type certification activities. In conclusion, the specific tasks of WTD 61 encompass development support as well as aeronautical and technical qualification activities in all national and international flight test projects in which Germany has a stake. Specialist tasks related to aeronautical navigation, avionics, mission systems and propulsion systems are dealt with by WTD 61 in its own responsibility.

sponsibility. In order to fulfil its tasks, WTD 61 runs its own airport, equipped with all required technical facilities, test aircraft (including related measurement technology) and a wide spectrum of test facilities (drop zone, engine test stands, firing range etc.).

Over the coming years, adapting its own organisation of flight operations to European and international developments will be one of the Technical Center's major challenges. WTD 61 will apply these European and international provisions for the first time during the in-service use of the A400M aircraft. It is planned to extend this practice to other aircraft types. WTD

Photos: Bundeswehr



LUH ejecting flares

German Navy already tested its torpedoes in the Eckernförde Bay and built a torpedo experimental station in 1912. Today, 600 staff members at WTD 71 use their know-how to develop, test and procure naval weapon systems. Scientists and engineers, qualified and experienced technicians, tradesmen and mariners have made WTD 71 the centre



A400M – trial of the self-protection system

61 will gradually adjust the organisation of its projects and processes to these international regulations and thereby lay the groundwork for enabling cooperation in international projects.

In doing so, WTD 61 will continue to have the capacity to carry out its activities with a high level of expertise.

Bundeswehr Technical Center for Ships and Naval Weapons, Maritime Technology and Research (WTD 71)

The Bundeswehr Technical Center for Ships and Naval Weapons, Maritime Technology and Research (WTD 71) has a long tradition in Eckernförde. The Imperial of professional expertise in the field of maritime defence technology within the entire armaments sector. After several reforms, WTD 71 now comprises a total of nine facilities located all over the state of Schleswig-Holstein.

The latest comprehensive reorganisation took place in the spring of 2016 and resulted in the agency being restructured into five divisions which are responsible for the agency's core tasks.

The division "Ship as a Weapon System" focuses on the integration of individual components and subsystems into a functional and operationally safe maritime weapon system. This includes primarily test and demonstration activities and the

determination of additional operational parameters and functional limits. In October 2016, this division conducted the final acceptance trial of the U36 submarine (second batch of U212) after it had successfully completed a function test. At present, the first frigates of the new F125 generation are undergoing trials.

The division "Ship Technology, Combat Survivability" is in charge of naval engineering tasks related to the development, procurement and use of ships and boats of the German Navy. This includes the traditional shipbuilding disciplines, main propulsion engineering, auxiliary systems engineering and marine electrical engineering as well as a special field of activity dealing with shock and vibration resistance.

The main tasks of the division "Reconnaissance, Effects, Force Protection" include the investigation and provision of technologies for further development of and defence against maritime weapons. An engineer working in the field of underwater weapons has to deal with vessel technology, with a particular focus on hydrodynamics, propulsion technologies, energy accumulators, metrology and control engineering. In addition, he works on underwater sensors, including the associated signal processing for minehunting.

The division "Sensor Technology, Signatures, German CSSM Representative" is in charge of military maritime sensors and ship signatures, which are of particular importance with respect to passive ship protection and sensor development throughout Europe. It also contributes German staff to the international "Center for Ship Signature Management (DEU-NLD)", based at WTD 71 in Kiel.

The division "Underwater Detection and Communication" performs tasks related to SONAR, waterborne, structureborne and airborne noise and underwater communication. Acoustic propagation and backscatter modelling methods are used to make predictions of the performance of sonar and underwater communication systems and to assess alternatives. Studying the oceanographic, meteorological and geological influence of the maritime environment completes the division's range of activities.

WTD 71 operates a number of noteworthy test facilities, some of which are unique in Europe:

- Measuring points for magnetic measurement and treatment of ships and components, including a large field simulator for ships of up to 1,000 tons displacement
- Earth's magnetic field simulator
- Acoustic measurement points in shallow and deep waters
- Underwater and above-water tracking ranges
- Test area for underwater demolitions
- Torpedo firing range and firing lane
- Test facilities for environmental simulation
- Engineering test stands
- Measuring site for antenna models
- EMC measuring chamber (EMC = electromagnetic compatibility)
- Test sites for air and surface targets and projectiles
- Fleet of five research and trial ships
- Horizontal and vertical shock test facilities (with a nominal load of up to 3 tons)

The measuring campaign described below was one of the highlights of the WTD 71 operations in 2016. It is a good example of the agency's efficiency.

NEMO 2016 Measurement Trials in Norway

Each year, the "Above Water Warfare Capability Group (AWWCG)" - a subgroup of the NATO Naval Armaments Group - conducts multinational trials called "NATO Naval Electro Magnetic Operations" (NEMO). The purpose of the NEMO trials is to provide an environment for trials, verifications, measurements and exchange of experience in the field of electromagnetic ship protection. In 2016, the trials were conducted in Norway in the sea areas around Andøya airport. Andøya is an island located approx. 300 km north of the Arctic Circle. The site has extensive freely usable sea areas, a very clean electromagnetic environment, excellent logistic support and a sufficient number of sites to set up the large number of measuring devices that allow an extensive view of the used sea areas. Nine ships and 26 shore-based and airborne measuring and test systems from eight nations were employed. In peak periods, up to 800 persons were involved in the preparation and

conduct of the trials. WTD 71 contributed a radar homing head for threat simulation, the MARSIG radar signature measuring system, the SAMIRA infrared homing head simulator and a GPS jammer.

Threat simulation with a real radar homing head is essential for all participating nations in assessing the effectiveness of electronic countermeasures and other passive measures (e.g. chaff). The SAMIRA radar homing head simulator allows the systems and takes co-responsibility for three areas of technology. Apart from its own research activities, WTD 81 provides substantial support to the project managers at the Federal Office of Bundeswehr Equipment, Information Technology and In-Service Support (BAAINBw).

Kalvarienberg, 100 metres above Greding (Bavaria), is home to WTD 81 and to one of Europe's largest absorber-lined chambers for the study of electromagnetic compat-



Submarine undergoing magnetic measurement in the earth's magnetic field simulator

investigation and optimisation of countermeasures against infrared homing heads. The results can be compared under the same environmental conditions using different measuring methods and systems for radar signature measurement (e.g. MAR-SIG). The measurement of a variety of ship structures, ranging from old designs to the latest stealth designs, provided a unique opportunity to assess the effectiveness of the various countermeasures while also pointing out their limits.

The improvement of national evaluation and assessment expertise in the field of electromagnetic ship protection is of direct and indirect benefit to the soldiers' safety. It is used for expert advice to projects, new ship constructions and retrofitting of naval units, especially for the evaluation of alternative ship designs and the proposal of ship protection and countermeasure solutions.

Bundeswehr Technical Center for Information Technology and Electronics (WTD 81)

WTD 81 performs a wide spectrum of tasks in the area of information technology (information collection, transmission and processing) for several Bundeswehr ibility (EMC) and electro-magnetic effects. Both the interference emissions and the immunity level of all types of electronic components and devices including even entire land-based platforms and helicopters are qualified in accordance with the relevant national and international standards.

Apart from that, the possibilities of generating electromagnetic fields with large field strengths are researched in order to specifically interfere with other electronic systems.

One of the world's largest domed buildings, measuring 45 metres in diameter, which houses a unique target simulation system, is located in the close vicinity of WTD 81.

The target simulation dome of WTD 81 provides an environment for hardware-inthe-loop simulations of optical and optronic components and systems exposing test objects to scenes and targets covering different spectral ranges from UVB to long-wave IR. Two powerful motion simulators are available to simulate the motions of components. The modern Center of Interoperability, NCW and Simulation (ZINS) went into operation in spring 2013. ZINS is equipped with a large media wall, an audio system, laboratories and multi-purpose rooms and several Gigabit LAN connection capabilities. It offers very flexible possibilities for test setups, parallel analysis activities, meetings, documentations of results and reviews. When carrying out multi-project networking experiments, interoperability and performance in an integrated system can be studied at all stages of the CPM. The video signal sources of all IT included in the experiment can be connected to the media wall (7.8 x 2.6 m) and other projectors via encoders using the centre's LAN. The media wall allows to change size and tested, focussing especially on the probability of detection and the false alarm rate. The implementation of efficient electronics and IT technology in modern and highly complex weapon systems requires extensive functional trials and acceptance inspections at WTD 81. Currently, the PUMA infantry combat vehicle is an example of how this weapon system is made "fit" for a long term employment in the military units within the scope of integrated compliance demonstration at WTD 81. These measures also include considerations about safety as-



View of the WTD 81 from the south-west

position of the projections quickly and in manifold ways thus facilitating the evaluation of the tests.

Being competent, innovative and efficient, WTD 81 is an important employer in the Bavarian region of Middle Franconia. The potential of its personnel and its well-established areas of activity qualify for being a future-oriented high-tech centre with high-quality workplaces.

The great commitment and state-of-theart knowledge of the employees combined with the latest technology and infrastructure guarantee the high performance portfolio of WTD 81.

Current Projects

In the area of activity of "electronic warfare", radar and missile warning sensors are tested in complex flight and ground tests. This ensures the survivability of all flying Bundeswehr platforms equipped with such self-protection equipment. Realistic scenarios from a large variety of live emitters consisting of different radar equipment, IR and UV simulators are provided for fixed-wing and rotary-wing aircraft, transport and combat aircraft. The correct classification and direction of the threat is, for example, pects and important query functions on the system status to guarantee safe and reliable operation during a mission and/or to support logistics in the event of maintenance and failures.

Since its inclusion in BAAINBw defence projects such as the new Tactical Air Defence System (TLVS), WTD 81 has contributed considerably to an effective and successful project management.

Bundeswehr Technical Center for Weapons and Ammunition (WTD 91)

Tasks and Facilities

WTD 91, located in Meppen, is the Bundeswehr competence centre for weapons and ammunition and has gained comprehensive specialist competence in this field. Apart from all weapon and ammunition inspections, the specific requirements of the weapons carrier regarding weapons and fire control, protection and effects, reconnaissance, and target recognition also form part of the agency's research.

Moreover, the Technical Center holds significant competences in the fields of acoustics, optics, optronics, simulation engineering, geoinformation, special engineer infrastructure, and measurement engineering. The agency's excellence centre for explosives is the only authority responsible for the qualification and safety evaluation of military explosives as well as for the central ammunition surveillance in the Bundeswehr.

These are the subject areas WTD 91 is occupied with:

- Explosives
- Gun systems and their ammunition
- Missiles, missile systems, guided missiles, and air-dropped weapons
- Fuses and fusing systems
- Propellants and drive technology
- Mines and mine countermeasures as well as protection against booby traps
- Warheads and penetrators
- Effect and protection
- Ballistics
- Optics/optronics
- Simulation, battlefield reconnaissance and sensors
- Laser technology
- Acoustics.

In addition, WTD 91 is responsible for the project management n accordance with CPM (amended) for Bundeswehr geoinformation affairs, ammunition packages as well as ear protection and acoustic material.

These are some of the responsibilities of WTD 91:

- Operations analysis including management of the expert teams for the analysis of incidents on operations involving mines, explosive ordnance, and booby traps
- National inspection authority for infantry weapon ammunition
- Quality inspection, especially pilot lot testing (first examinations within the framework of the CPM (amended))
- Statutory explosives testing in accordance with the First Regulation of the Explosives Act for all of the Bundeswehr's in-service explosives, and material qualification of the components pur suant to STANAG
- Classification of ammunition and explosives based on the Dangerous Goods Transportation Act (GGBefG)
- Classification of lasers and future artificial optical emitters
- Conducting training courses concerning the secure handling of ammunition and explosives

With an area of ca. 7 x 32 km, WTD 91 is the largest Bundeswehr Technical Center and also the largest fully instrumented ground firing range in Europe. Taking the danger areas into account, a maximum firing distance of up to 28 km can be achieved.



PUMA armoured infantry fighting vehicle equipped with anthropomorphic test devices

The agency can fulfil its many tasks thanks to a unique infrastructure with numerous firing positions, firing ranges and tunnels, demolition ranges, bombing locations, and different target areas which allow the testing of a variety of weapon systems. In addition, several well-equipped work centres and laboratories are also located there. Mechanical loads as well as all climatic conditions that equipment of the Bundeswehr is exposed to can be simulated in an environmental simulation centre. The agency is further equipped with a missile test field, a test and integration environment for camp protection, and sensor-supporting measuring arc for the multispectral signature measurement of different kinds of objects or for the inspection of sensors with the help of reference objects. The infrastructure of the agency also features a high-velocity sledge track, which can be used for the testing of geopenetrators (effectors with very high penetration rates in soil and concrete, due to their shape and material properties) or for ejection tests of pyrotechnical decoys of air vehicles.

WTD 91 is responsible for specialist tasks in all CPM (amended) phases. For example, it contributes to the technical support of functional capability requirements and to the development of solutions in the analysis phase. The integrated compliance demonstration is the main point of interest during the realisation phase, with the aim to identify possible defects in products through intensive testing and to develop recommendations for product improvements. WTD 91 directly cooperates with the Federal Office of Bundeswehr Equipment, Information Technology and In-Service Support (BAAINBw) and the other Bundeswehr technical centers of the organisational area Equipment, Information Technology and In-Service Support (AIN), but also with the Bundeswehr military facilities and European partners.

Current Testing Projects

Some examples from the WTD 91's numerous tasks and current projects are presented in the following:

Among the core responsibilities of the agency are the testing of guns, gun systems, and gun ammunition of all calibres, including the corresponding gun mounts and the integration into various vehicles and other weapon carriers. The inspections are conducted with respect to function, performance and safety in the different stages of procurement and in-service use. A prime example for this is the testing within the framework of the integrated compliance demonstration for the system acceptance of the LEOPARD 2 A7 main battle tank. The focus of recently conducted tests lay on system adjustment for the DM11 round (with hollow charge), testing of a new third-generation thermal imaging device for gunner optics, and an adjustment for the drive control and information unit.

An example of the technological system support for all missile, guided missile, drone, and aerial delivery systems of the Bundeswehr is the German Air Force system firing campaign with the weapon system TAURUS at the Overberg Test Range in South Africa. WTD 91 was in charge of creating the draft for the test scenarios and of the evaluation of the test results. Two different test scenarios were used. Functionality of the weapon system could be demonstrated in both tests.

With its longstanding experience and excellent equipment, WTD 91 is responsible for the subject areas occupant protection and individual protection as well as operations analysis. WTD 91 has recently been involved in numerous projects in the context of occupant protection, such as the PUMA armoured infantry fighting vehicle, the BOXER multi-role armoured vehicle in the version "armoured personnel carrier", the protected recovery crane vehicle, the WISENT 2 CAN armoured engineer vehicle, and vehicle protection equipment for the MULTI truck. The task was to collect and analyse measurement data and to evaluate the strain on humans. The focus mostly lays on improving the protection against booby traps, mines, and ballistic threats as well as crashworthiness of vehicles.

The Bundeswehr Research Institute for Protective Technologies and CBRN Protection

The core responsibilities of the Bundeswehr Research Institute for Protective Technologies and CBRN Protection (Wehrwissenschaftliches Institut für Schutztechnologien – ABC-Schutz, WIS), located in Munster, include the protection against biological, chemical and nuclear weapons of mass destruction and their effective components. Other primary tasks include fire protection technology, protection against strong electromagnetic fields and water treatment.

As a research facility of the Federal Ministry of Defence WIS develops technical and scientific fundamentals and ensures the provision of information in its field of activity at national level.

With its studies, demonstrators or tests WIS provides technical contributions to a wide variety of projects within the armaments sector. There is a close coordination between the Project Managers involved and the respective Services.

The approximately 200 WIS employees who mainly have a natural scientific qualification are working in laboratories, pilot plants and facilities for full-scale testing on issues relating to detection, individual and collective protection and the treatment of contaminated materiel. This includes weapon convention verification activities (biological and chemical weapons) and activities related to occupational safety and health issues within the Bundeswehr. In addition, WIS operates the Bundeswehr Central Radioactive Waste Collection Center.

Electromagnetic Effects

Defence materiel must be hardened against nuclear weapon effects, i. e. its primary functions must remain operational at predefined distances from the ground zero. The electromagnetic pulse (EMP) generated during a nuclear weapon detonation, but also non-nuclear high power electromagnetic (HEPM) fields is/are capable of jamming or destroying all kinds of unprotected electronic components within a large radius. WIS is able to determine the protection level of military equipment including large-scale systems on the basis of measurements and to develop productspecific suggestions for improvement by conducting research on electromagnetic effects (EME). The spectrum ranges from individual electronic components up to tanks and aircraft.

Fire Protection

Protected vehicles, seagoing and flying units, due to their nature, particularly pose special challenges to fire protection. Therefore, the aim is to provide the highest possible level of protection against fires and their consequences during day-to-day routine at home and in an operational environment. The activities at WIS focus on fire detection, fire suppression by means of automatic fire extinguishing systems and ecologically-friendly extinguishing agents for Bundeswehr-specific applications.

With the exception of individual tests, full-scale fire tests may also include the fire-fighting on the actual object, e. g. on models of protected vehicles having the original size.

Water Treatment

Clean drinking water and service water is a natural and essential prerequisite for everyone.

But how is this to be ensured during a Bundeswehr mission in a crisis area or even in a contaminated environment? This special problem is addressed by the WIS Water Treatment Branch.

Decontamination

Units and mission-essential equipment must immediately be subjected to decontamination if they have been exposed to biological or chemical warfare agents, radioactive fallout or toxic industrial chemicals. This is the only way to minimise harmful effects and to restore operational readiness. WIS conducts testing of procedures and equipment for CBRN decontamination, it accompanies new technical developments by industry and with its own examination programmes and research projects contributes to the fact that decontamination



Service-life test of a swash plate of the weapon system CH53G on a clamping field

agents and procedures are introduced into the Bundeswehr which have a better material compatibility, are environmentallyfriendly and pose a smaller logistical burden.

Detection

Detection systems serve to locate, identify and detect radiation, biological and chemical warfare agents. WIS conducts scientific fundamental studies using laboratory procedures, man-portable measuring devices and vehicle based sensors to facilitate new or improved detection methods, it develops laboratory prototypes and tests prototype manufactured by industry with respect to their performance and their suitability for Bundeswehr operations. As far as technical matters are concerned, WIS is involved in the procurement process and in maintaining the operational viability.

Protective Equipment

Crucial components of a soldier's personal protective equipment are the CBRN protective mask and the overgarment, i.e. the CBRN defence suit. Missions in hot climatic zones and new threat scenarios require, as far as clothing is concerned, physiologically improved protective equipment offering a higher level of protection.

The fundamental studies necessary for this purpose are conducted at WIS and laboratory prototypes are optimised in close cooperation with industry. Following the introduction into service, accompanying Government Quality Assurance is conducted to ensure the high performance potential of the procured equipment.

"Research Work - Testing - Consulting Services. For the safety of our soldiers." According to this slogan WIS, with its versatile spectrum of tasks, provides a large share to future-oriented, functional equipment for the Bundeswehr and thanks to its research findings it also makes a significant contribution to CBRN protection.

WIWeB-Service Provider for the Bundeswehr

The Wehrwissenschaftliches Institut für Werk- und Betriebsstoffe (WIWeB, Bundeswehr Research Institute for Materials, Fuels and Lubricants), located in Erding (headquarters) and Wilhelmshaven, is a federal specialist research establishment. The mission of conducting research and driving development provides the basis for its scientific status. WIWeB is the Bundeswehr competence centre for technology, security and reliability of materials, fuels and lubricants in use as well as for clothing and personal equipment. Apart from these main fields of work, it also deals with issues related to the safety of chemicals, occupational safety and health, and environmental protection. WIWeB is accredited for the majority of testing procedures that are being conducted in accordance with DIN EN ISO/IEC 17025. Moreover, it has been successfully evaluated by the German Council of Science and Humanities. In the demands placed on the work of this institute there has been a clear shift towards understanding and assessing the function of the above-mentioned materials/products within the context of the entire system - not least as a result of the Bundeswehr missions abroad. Besides deep specialist knowledge complemented by marked interdisciplinary thinking,

this requires networking and cooperation with all elements of the Bundeswehr, the defence industry, and European and extra-European partners. The strategic planning of this institute is consistently geared towards extending these capabilities and networks. The research of the WIWeB focuses on specific issues of the military supplier and user concerning the employment of new materials and their technological application, both in the context of the development of new weapon systems and new equipment as well as their later in-service use. The various aspects of securing mobility, protection and reliability form the core subjects. In light of the services provided for the Bundeswehr during the weapon systems' in-service phase, analysis and evaluation are among the main responsibilities of WIWeB in this regard. Nevertheless, developing new technologies for specific subareas is also part of their work. Budget funds from the corresponding technology sector "Materials, fuels and lubricants" and from other technology sectors are available for project funding. The various independently acting research and development sectors are presented in the following.

Materials/Surfaces

WIWeB is responsible for structural materials, which are relevant for the strength and stiffness of a system. With the help of state-of-the-art equipment, all pertinent properties of test samples or larger components can be analysed for a wide temperature range. Numerical analysis methods for simulating physical and mechanical properties are also available.

The directing centre for welding and bonding technology of the Bundeswehr is located at WIWeB. The analysis of new materials, construction methods and joining processes is part of its research work. The subject areas lightweight construction, effects and protection are of particular interest here, as well as additive production methods (3D printing).

POL Products

With its technical competence and expertise, WIWeB is responsible for supplying the force with efficient petroleum, oils and lubricants. These have to be compatible with the corresponding materials and they have to meet the special technical and climatic requirements. Currently, the focus lies on studies on alternative fuels, fireresistant hydraulic fluids and the miscibility of POL products. WIWeB is responsible for the in-service support control for POL products, paints, varnishes and chemicals of the Bundeswehr.

Clothing/Personal Equipment

WIWeB prepares the specifications for clothing and personal equipment of the soldiers as well as for technical textile products and aviation safety textiles, which includes defining and testing camouflage methods on textiles and wear comfort. The work is based on numerous own and outsourced research projects. The clothing concepts for the Future Infantryman and the Combat Clothing Operations / Exercises are currently being merged into the Set of Combat Clothing Armed Forces. The new set of clothing thus serves both the common soldier as well as the soldier responsible for specialist tasks.

Hazardous Substances

This field of work is concerned with issues pertaining to hazardous substances over the entire life cycle of products. The Hazardous Substance Measurement Office Süd of the Bundeswehr crucially contributes to The German Liaison Office for Defense Material U.S.A./Canada represents the Bundeswehr's interests in matters of defence technology and armaments vis-à-vis the armed forces and agencies of the United States of America and Canada (U.S.A.) and the industry of these countries. Transatlantic cooperation covers a wide spectrum of defence-related technologies and various weapon systems in the areas of land, air and sea.

The agency's personnel largely consists of engineers and scientists but also lawyers and non-technical clerical administrative personnel. About half of the personnel on the agency's 45 posts is assigned to project offices (Rolling Airframe Missile Project Office (RAMPO) in Crystal City/ VA, German Patriot Office (GEPO) in Huntsville/AL, Multifunctional Information Distribution System International Program Office (MIDS IPO) in San Diego/CA and liaison offices at U.S. Army and Air Force facilities.



The office building in Reston, Virginia

occupational safety and health at home and in the deployment areas by determining and assessing the exposure of employees to hazardous substances. Moreover, WIWeB takes on an advisory role in safety and chemical matters concerning batteries.

Quick Answers to Complex Issues

WIWeB ensures the MoD's own specialised capabilities with respect to analysis, judgement and advisory activities. It is capable of delivering quick answers to complex issues in the context of a Bundeswehr operation (e.g. concerning damage, service life, and contaminants).

German Liaison Office for Defense Materiel, USA/Canada

The German Liaison Office for Defense Materiel, USA/Canada (DtVStRü USA/CAN) is a subordinate agency of the Federal Office of Bundeswehr Equipment, Information Technology and In-Service Support (BAAINBw) and is located in the US federal state of Virginia. The DtVStRü USA/CAN's range of tasks and activities is oriented towards employing the respective available national resources as efficiently and effectively as possible in the context of bilateral and multilateral cooperation. This can strengthen military and industrial capabilities and bring about the development of joint standards and interoperable solutions for the mission-oriented equipment of the armed forces. The development and procurement of the MIDS Low Volume Terminals (LVT) and the joint development and procurement of the Rolling Airframe Missiles are examples of this. The DtVStRü USA/Can is a competent point

of contact for initiating and coordinating armaments cooperation with the USA and Canada in the field of research and technology as well as joint development and procurement programs and contributes to maintaining and developing the capabilities of the national defence industry. Other focuses of its work are the acquisition of US and Canadian defence goods for the



Air photograph of the Naval Arsenal in Wilhelmshaven

Bundeswehr and managing personnel exchange programs with defence engineers and defence scientists as well as administrative personnel of both nations.

A government quality assurance representative who conducts quality management and government quality assurance on products ordered in the USA according to the contractual acceptance criteria is also a member of the agency. These tasks are also performed in cooperation with US and Canadian government quality assurance authorities.

The liaison office supports and promotes armaments cooperation between the Federal Republic of Germany, the United States of America and Canada, its principal objective being to provide Bundeswehr military personnel and that of partner nations with the best possible equipment (e.g. in the RAM project).

It contributes to building up the mutual trust needed for effective transatlantic armaments cooperation by way of continuous dialogue with the US and Canadian partners.

The Naval Arsenal

Apart from the few military repair capacities aboard the ships and boats and in the system support groups, the German Navy does not have any rear maintenance forces. Maintenance activities above unit level including the units afloat as well as the shore facilities of the Navy are therefore transferred to the Naval Arsenal in Wilhelmshaven.

The Naval Arsenal is the agency with the largest number of employees within the organisation of the Federal Office of Bun-

deswehr Equipment, Information Technology and In-Service Support (BAAINBw), holding a special status due to the tasks assigned to it.

The Naval Arsenal is managed and operated by civilian personnel only and cooperates closely with its military management partner, the Naval Support Command. Its name reflects the Naval Arsenal's close task-related ties with the Navy. In its workshops, specially qualified personnel repair the weapons, command and employment systems of the ships and boats. Where the components of a ship in a classic sense, such as shipbuilding and engineering systems and devices are involved, shipyards and equipment manufacturers repair the ship and boat hulls. The Naval Arsenal awards the respective contracts in pan-European competitions.

. The Naval Arsenal's mission encompasses the following areas:

- Scheduled maintenance: Similar to the vehicle maintenance inspections, every German naval unit undergoes such maintenance and repair work in regular intervals.
- Immediate repair: Unlike scheduled maintenance, immediate repair requires repair of the affected systems and devices on board with the least possible delay, and thus directly serves to maintain operational readiness of ships and boats. Immediate repair is therefore not only performed at the home naval bases but also worldwide at the unit's respective location during international missions. For this purpose, specialist teams of the

Naval Arsenal are assembled and sent on-site at short notice.

- Unscheduled maintenance projects: They are initiated when repair measures are too extensive and require too much time to be performed within the scope of an immediate repair.
- Product modifications: Keeping naval vessels in service for approx. 30 years requires continuous adaptation to the ever changing operational conditions, military and legal requirements and new technologies. Such product modifications are developed and, in part, also implemented at the Naval Arsenal.
- Performing of technical tasks: The Naval Arsenal employs its know-how in all areas of the ship as a technical system to contribute substantially in all phases to the development of new ships and boats. Being thus involved in several ways in the current developments, it can prepare for its future role as an in-service support provider.
- Decommissioned ships and boats of the Navy: The Naval Arsenal maintains these vessels on behalf of the German Federal Government until a decision has been made about their further use or their final disposal.

Its own maintenance and repair capacities, workshops for electronics, communication systems, optoelectronics, weapons engineering and weapon control technology are concentrated at the Wilhelmshaven arsenal installation. Additionally, the arsenal installation maintains outsourced workshops for the necessary support of submarines and minehunters in Kiel.

The engineers and technicians of the headquarters' "Technical Systems Service" manage all maintenance activities and revise the product modifications. For reasons of technical monitoring and quality control of repair services performed by industrial companies, the Naval Arsenal employs technical personnel at various shipyards. This sharing of tasks has paid off for decades and shows the close cooperation between the public and the private sector.

For the class F123 and F124 frigates, the Naval Arsenal and its technical management personnel assumes the role of prime contractor. What is known as "self-maintenance" proves to be very successful with ships of these classes. Apart from its economic advantages, self-maintenance also ensures that the know-how remains with the Naval Arsenal.

The fact that 90 per cent of the approx. 1,000 employees underwent technical training and are skilled workers, master craftsmen, technicians or engineers also reflects the Naval Arsenal's special assignment.

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