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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 Defense Administration that is responsible for satisfying the armed forces' requirements in terms of materiel and for managing the in-service use of materiel fielded in the Bundeswehr 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 Centers, two Bundeswehr Research Institutes, the Naval Arsenal and the German Liaison Office for Defense Materiel, U.S.A./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 request and at economic conditions, is a demanding task. Although often 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 such complex materiel takes time: time to develop the necessary technical solutions, prepare the contracts for such developments 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. What is more, 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 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 support from the moment the respective materiel was handed over to the user. The tive 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. From this perspective, 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 and Information Technology (Bundeswehr IT Office) were merged but also that elements of other Bundeswehr of-



The Federal Office of Bundeswehr Equipment, Information Technology and In-Service Support (BAAINBw) is located in Koblenz.

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 cyclerelated 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 the procurement and in-service support process in order to implement this integrafices 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 BAA-

BAAINBV

hoto:

INBw 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

With a view to 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 showed the way, so to speak, towards a more transparent, more effective and more modern armaments organisation.

The consequences of the Armaments Agenda also included organisational changes within BAAINBw and its area of responsibility. This "moderate readjustment" was the result of the findings and the experience of recent years and aimed 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 so far: The first step was the creation of a Program Organization (PMO) at directorate



The "Rheinliegenschaft" compound of BAAINBw

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 pur-

chasing 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 on 1 October 2016, which performs steering functions within close reach of the Executive Group.



- Vehicle systems
- Mobile air defence systems
- Weapons and ammunition
- Protection systems

- Mission equipment
- Simulation and training
- Surveillance systems



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 Central Affairs Directorate and the Common Technical, Logistic and Economic Activities Directorate were created on 1 July 2017, accompanied by the disbandment of the P, Q and Z Directorates.

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 OS1 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, 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 OS1 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 Defense and Budget Committee meetings. With respect to German Audit Office affairs, OS1 has the primary responsibility for coordinating all incoming matters concerning planned auditing activities of the German Audit Office and the regional audit offices.

The tasks of Division OS2 include coordination of the cooperation with the Bundeswehr Office for Defense Planning, status surveys and portfolio management regarding the activities of BAAINBw in the sectors of projects, products and services. In practical terms, this is where the BAA-INBw productive process is initiated and surveys are compiled with regard to selected information requirements.

In accordance with the "Executing Integrated Planning" output process, the Bundeswehr Office for Defense 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 defense-related services, Division OS2 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 OS2 thus supports the Bundeswehr Office for Defense Planning right from the start of the procurement process in determining the parameters of a project across the overall period of its existence (from creation to service use) so that they can be taken into consideration in the decision-making process – a fundamental contribution to portfolio management in the Bundeswehr.

In the framework of portfolio management, OS2 will develop 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 made available in a sub-portfolio. The latter is analysed and alternative courses of action are proposed, which are then harmonised with the Bundeswehr Office for Defense 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, OS2 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 Project Steering Group established between



Organisational chart: Operational Management Staff, Executive Secretary of BAAINBw



The Rauental district of Koblenz is home to the majority of BAAINBw personnel.

the Bundeswehr Office for Defense 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. In an advisory function, OS3 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 periodic or eventrelated analyses and assessments regarding the progress of 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 Defense level and the biannual Armaments Report to the Parliament, the division 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.

After the successful introduction of the risk management for Category A projects (at the State Secretary level) and Category B projects (at the level of the Director General for Equipment or Cyber/Information Technology), the risk management will also be applied to Category C projects (at the level of the BAAINBw Director-General)-initially for projects worth more than €10M. The first preparatory committee meeting for Category C projects was an important milestone with regard to the widespread introduction of the risk management for armaments projects. It was chaired by Director-General Harald Stein and took place at BAAINBw on 9 May 2017. In the meantime, further preparatory committee meetings were held at BAAINBw for Category C CPM projects. The aim of Division OS3 is to extend the risk management method to the other Cat C projects and, at a later time, also to Cat D 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 geared toward mediumterm and long-term objectives. In addition, agreements on objectives are being prepared within the framework of decentralised controlling (extension of FMoD strategic controlling to the subordinate levels) in order to create the prerequisites for consistent topdown control. Additionally, OS3 supports the BAAINBw Executive Group in drafting and monitoring compliance with the Annual Directive, which contains the strategically



relevant objectives of the Federal Office. In addition to the project risk management, the Annual Directive forms the second pillar of support services for the BAAINBw Executive Group in the area of strategic control. As a third pillar, an information tool is being developed for the BAAINBw Executive Group, which is used to compile current information acts as the output process manager for the "Provision of Material Solutions in accordance with the CPM"

The Equipment, Information Technology and 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 agement 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

edge

project personnel; qual-

ity assurance regarding all these procedures/

methods; control of the services provided under

framework agreements

on project management

support. In the context

of the BAAINBw Knowl-

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 creat-

ing the necessary framework conditions. At the same time, specialist

Management



Organisational chart: Operational Management Staff, Executive Secretary of BAAINBw

and recommendations for action regarding executive matters within the framework of a dashboard.

Division OS4 constitutes the centre of expertise for projects/products/services. Essential tasks of OS4 are the standardisation and advancement of management techniques for all projects, products and services, including rules on Requirements Engineering and the Prioritised Requirements Catalogue. OS4 is in charge of providing advice to project personnel and of preparing concepts for active practice-oriented training. 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.

Another task of the center of expertise is the control of the services provided under framework agreements for management support.

Division OS4 is responsible for policy matters related to the Customer Product Management (CPM) procedural provisions and

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external communication of the AIN Organizational 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 includes, 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 multimedia 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 Organizational Area.

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 man-

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

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tivities 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

The Program Organization (PMO) combines the project management for the key armaments projects in a new structure: the MKS 180 multi-role combat ship, the tactical air defence system (TLVS) and the European drone. Specialists from various fields of technical, commercial and legal expertise are directly assigned to the respective project exclusively focusing on their project by performing their tasks in a largely independent manner.

A comprehensive modernisation of armaments procurement, known as the Armaments Agenda, was initiated on the basis of the 2014 "Comprehensive survey and risk analysis of major armaments projects." The results included in 2015 the decision to prepare a PMO, which was realised in 2016 within the scope of a moderate readjustment of BAAINBw. It is expected that the differences and peculiarities of these three large armaments projects can be better considered within the organisation-oriented structure of the PMO.

promotes close information exchange and optimised coordination of technical, commercial and legal aspects. On the other hand, the flat hierarchy in connection with the assignment to the Division for Strategic Armaments Projects, which is directly subordinate to the State Secretary for armaments at the Federal Ministry of Defence (FMOD), allows for an immediate and swift management. The PMO director's right to direct access to the State Secretary is a visible sign of this flat hierarchy. The PMO is organised into four groups and a staff. Three groups (PMO1, 2, 3)



PMO organisational chart

Once the organisational setup was completed in April 2016 and its operational capability was established, the BAAINBw directorates "Sea", "Combat" and "Air" transferred their respective responsibilities, i.e. for the MKS 180 multi-role combat ship, the tactical air defence system (TLVS) and the study on the multinational preparation of the development of the European drone, to the PMO.

On the one hand, the PMO responds to the demands of these strategic key projects by having specialists from various fields cooperate with a direct focus on the projects. The organisational consolidation are responsible for the projects. A fourth group (PMOJ), which incorporates the PMO's legal expertise, is led by the projects legal advisor. Each of these legal experts is permanently assigned to a particular project. The PMO currently has a total number of 115 posts, 13 of which belong to PMOJ.

The position of the PMO director 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 is a member of the project-related steering bodies at the Federal Ministry of Defence (FMOD). The projects' legal advisor supports him in his capacity as deputy director. He is thus not only responsible for the timely and proper legal management of the projects, but has also managerial responsibility in the PMO.

The establishment of this new organisational form has provided the prototype foundations for modern armaments management methods to be implemented in the three projects.

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

After two years of routine operation, the methodical approach behind the PMO has proven its potential and offers a further organisation model with established processes in the armaments sector.

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. In order to be able to use the MKS ships during a period of up to two years on deployement while, at the same time, significantly reducing the crew size compared with units in service, 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 minimise in-service costs from the beginning.

The course of the award procedure has so far underlined the suitability of the approach chosen for the MKS 180 procurePMO1 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 (Medium Extended Air Defence System) 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 US\$4Bn, 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





The Program Organization is responsible for project management for the important armament projects Multi-Role Combat Ship 180, Tactical Air Defence System (pictured) and European Drone.

ment 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 further course, it will be important to conclude the process with acceptable bids together with industry on the basis of the experience gained in the negotiations.

PMO1 has a total of 34 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, processes and common project tasks. 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, including a national secondary missile infra-red imaging system – Tail/Thrust Vector Controlled Surface Launched (IRIS-T SL). The negotiations of the major implementation contract on the development of TLVS and the procurement of the first series-produced system for the operational tests with industry started in May 2017. The negotiations for the contract on the adaptive development of the IRIS-T SL surface-to-air guided missile for integration as subsystem of a future TLVS has, in the meantime, also been taken up. These contracts are closely connected to the procurement of necessary US components in the foreign military sales procedure. Thus the special challenge with TLVS is to prepare three contractual strands and to synchronise them with respect to time and contents. The course of the TLVS award procedure has confirmed the programmatic and technological complexity of the overall project which had already been expected within the scope of the selection decision of the Chief of Defence. The motto "thoroughness before speed" is especially true for such an exacting high tech project which, despite a positive prognosis, will be at the limits of what is technically possible. The priority is to conclude a good, exact and, above all, realistic contract to avoid having to cope with performance deficits or cost escalations in a few years.

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, within an acceptable cost benefit ratio. The relevant technical examinations have, in the meantime, been concluded.

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 predecessor project MEADS 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 program, the national TLVS project does not involve a comparable agency such as NAMEADSMA.

Currently, a total of 49 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

Additionally, the high reliability of TLVS on the tri-nationally procured MEADS technology and the projected inclusion of other international partners in the project, made it necessary to establish an independent "International Cooperation" element.

PMO3 – European Drone

Since 5 September 2016, Germany, France, Italy and Spain have been conducting a definition study for the development of a European drone. OCCAR (Organisation Conjointe de Coopération en Matière d'Armement) was entrusted with the management of the study. Currently, 13 posts at PMO3 are assigned to perform national tasks. 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 payloads. Unlike in previous multinational development projects, the participating nations wish to agree on the development of one drone that will be certified according to common standards, but still at national level. This is what the directors of the respective military certification authorities of the partner nations determined in March 2017 in the so-called "Signal of Munich." Apart from that, the heads of the national military certification authorities decided to realise also the participation in general air traffic in Germany and Europe via a step-by-step approach with respect to the regulatory and technical possibilities. The objective is to overcome the limitations of the previous MALE systems regarding their operation and also exercise activities in Europe.

A decision on the development and procurement of the system will be made based on sound cost estimates submitted by industry and on results from the study. The development phase of the European drone is scheduled to 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 providing the nations with an initial operational capability.

On the basis of the first results of the study, the nations involved agreed in 2017 upon a design with two turbo-propeller engine systems. Apart from that, the ca-

pability requirements and the design of the European drone were determined on the basis of further results at the beginning of 2018 within the scope of a system requirements review and were approved by the partner nations.

Based on this, three threads will be pursued in parallel in the further course. In one thread, the definition study will be performed upon its completion, the preliminary design review on the basis of the results of the study as well as a cost model will be available. In the second thread, the requirements for the contract on development, procurement and support of the initial flight operation must be created in line with the CPM (amended). The third thread will be the execution of the actual award procedure. The advantage of this parallel procedure is that the work on the project will be continued and that there will be no delay in closing the capability gap. In order to make the project more manageable, the decision has already been made that industry and official organisations will continue the lead nation principle practiced during the definition study also in the development phase. Giving up sovereignty on a small scale will ensure clear responsibilities and greater sovereignty on a large scale.



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Combat Directorate (K)

The task spectrum of the Combat Directorate (K) within BAAINBw is characterised by ground-based weapon systems and related components like main battle tanks and armoured transport vehicles as well as by infantry, engineer and artillery systems. Moreover, the Combat Directorate projects various ship-based and airborne armament systems and ground-based air defence systems and supports them during in-service-use.

Within the context of the "moderate" realignment and after the tactical air defence system (TLVS) project has been transferred to the programme organisation (PMO), Division K3 was disbanded and the remaining branches with their systems were integrated into Division K4.

Thus, three project divisions with five branches each pool the technical expertise of BAAINBw with regard to

- air-/ship-borne armaments systems, anti-armour systems and ground-based air defence systems (K4)
- armoured combat and transport systems, bridges and crossing equipment (K5) as well as
- artillery and mortar systems and their ammunition, infantry weapons and ammunition as well as engineer explosive ordnance (K6).

The general task of the Economics and Technology (K1) and Economics and Law (K2) divisions is to support the project divisions in the implementation of project and user management tasks as well as in research and technology. Apart from that, the K Directorate is supported by the Directorate Staff (KAS) and the Directorate Controlling (KAC) elements.

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

Branch K1.1 is the central armament, in-service use and logistics element for the Combat Directorate. This comprises all cross-

sectional tasks in the fields of armaments management, in-service use and logistics of Directorate-specific defence materiel. In addition, K 1.1 is responsible for ensuring the operational and functional safety of defence materiel, in particular ammunition safety and central tasks as regards the use of ammunition. Moreover, functional supervision is exercised for the Bundeswehr Technical Center for Protective and Special Technologies (WTD 52) in Oberjettenberg (Bavaria) and the Bundeswehr Technical Center for Weapons and Ammunition (WTD 91) in Meppen.

Branch K1.2 deals with future-oriented system-technological investigations on landbased platforms. The effect of ammunition against air, sea and ground targets, also in current scenarios such as MOUT (Military Operations in Urban Terrain), is assessed



on the basis of research, simulation and trials. The latter requires the determination of statistical safety distances, e.g. in order to estimate possible collateral damage. Survivability deals with technologies designed to improve the protection of vehicles and their crews against current threats. The current focus lies on research and technology (R&T) studies on active protection systems. Concepts of future-oriented IT system architectures define how existing platforms can be optimised and how future mobile platforms will be designed. Aspects of the increasingly required network centric operations are handled under the topic "systronics". In the functional area of system evaluation, simulation models and R&T concept studies are used to support the system-specific part in the implementation of weapon systems.

Branch K1.3 is responsible for fuse technology and documentation. The latter means that projects are supported by materiel documentation. State-of-the-art technology is used in the preparation of "Interactive Electronic Technical Documentation (IETD)" to support the users. Finally, K1.3 also manages projects on fuse technology and initiates and conducts relevant R&T studies.



The focus of Branch K5.1 is currently on the modernisation of a total of 104 LEOPARD 2 main battle tanks to the latest version LEOPARD 2 A7.

The capability to provide Joint Fire Support (JFS) merges the different forces and systems (e.g. sensors and effectors) in a theatre of operations and pools them in a framework of a networked system and thus enables, even on the tactical level, a rapid responsive fire support by means of the best-suited national or multinational weapon systems that is available in theatre. Branch K1.4 implements several armaments projects in order to realise the JFS capability: These include the vehicle project "Joint Fire Support Team/heavy (JFSTsw)", the command post elements "Joint Fire Support Coordination Group (JFSCG)" and the Tactical Data Link Interface Team Module as well as a system designed to improve the target location accuracy of ground-

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A new 60mm mortar system is to close the capability gap between artillery and directly fired infantry weapons; the picture shows British soldiers with a 60 mm commando mortar.

based reconnaissance systems (VeZobA). Apart from that, multi-project aspects of the functional capability of the JFS overall system are being considered and lessons learned within the scope of the JFS system's further development are specifically applied.

Research and technology (R&T), system technology activities as well as international cooperation tasks are pooled in Branch K1.5, which takes charge of these matters for the entire Directorate. Among others, K1.5 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.

Findings from studies are fed back directly both into the project work and into the work performed during the analysis phase. In addition, K1.5 represents BAAINBw in international R&T bodies.

The five Branches within the Division K2 "Economic and Legal Affairs" are in charge of public procurement, contract management and pricing regulations for the Combat Directorate. These Branches prepare, conclude and manage contracts for the individual projects of the technical divisions 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. Moreover, by way of administrative assistance for foreign nations which have acquired Bundeswehr materiel from the Federal Republic of Germany, contracts with German industry are concluded and managed. To supplement that, contracts are

concluded to enable and enhance friendly armed forces. Furthermore, equipment is procured for WTD 52 and 91 by the Branches of Division K2. 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 Directorate'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). In the field of antitank defence, the projects PARS 3 LR, MELLS, the weapon system WIRKMITTEL 90mm (RGW 90 LRMP) as well as the future weapon system WIRKMITTEL 1800+ constitute essential activities. PARS 3 LR is currently under series production and will be fielded from 2018 onwards. A comprehensive reprocurement process of MELLS guided missiles and the respective weapon systems will start very soon. To this end, the procurement contract has been concluded recently. The system WIRKMITTEL 90 meets the demand for effectors with capabilities that have not been available to the German infantry so far, such as the engagement of targets behind cover up to a range of 1,200 m, the engagement of protected targets, blinding the opponent as well as battlefield illumination in the IR range. The future system WIRKMITTEL 1800+ provides the forces with a relatively inexpensive guided-missile system that can effectively engage targets in an engagement range of up to 1800 m.

The essential tasks in the field of aircraftbased guided missiles are the product improvement of the HARM system, the basic repair of the MSOW TAURUS and the management of the Laser Guided Sidewinder and the Dual-Mode-Brimstone projects which fulfill the requirement of "short-range powered effectors" for the

Tornado and "medium-range powered effectors" for the EUROFIGHTER. Current projects in the field of airdropped ammunition include the GBU-48, the GBU-54 and the Mk-83 TIP. The GBU-48 serves to implement the air-to-ground role of the EUROFIGHTER weapon system. While the procurement of the bombs has been completed, the integration is currently performed by the Branch that is responsible for this weapon system platform. Also for the EUROFIGHTER, Mk-83 TIP, a system used to counter hardened targets, is being realised with reduced collateral damage potential. Fielding is scheduled to start in early 2019. For the TORNADO weapon system GBU-54 have been procured; this system has been in use since 2016.

In view of the end of use of the SEASKUA system the armament of Navy helicopters is currently not considered a priority. This will change significantly by providing assistance to the preparation of the capability gap and functional requirement document "Long-range guided missile system against sea and land targets for the Navy" where an aerial system is considered as armament for the maritime helicopters and the maritime patrol aircraft (MPA).

The main focus of K4.2 is currently on the ship-based missile systems RAM, ESSM, SM-2, HARPOON and RBS 15 and the future-oriented activities for a new generation of long-range land/sea target missiles and an active self-defence system of submarines with missiles that can be fired by the submarine. In the RAM project the development of the RAM Block 2B version has started in mid 2017 after the bilateral Memorandum of Understanding (MoU) and the contracts with industry had been signed. For more than 40 years now, this project has been a successful bilateral cooperation with the US. The development of the ESSM Block 2 missile is currently part of a multinational cooperation together with eleven partner nations in which Germany has been involved since 1977. In connection with the decision to purchase further type K130 Corvettes the supplementary procurement of further RBS15 Mk3 anti-ship/land attack missiles is currently being prepared. Within the framework of the German-Norwegian guided missile cooperation the "Naval Defence Materiel Cooperation MoU" was concluded in June 2017; in this context it is planned to jointly further develop the Naval Strike Missile System and to procure it as an armament system for different classes of German Navy combat vessels. Furthermore, within the context of the German-Norwegian cooperation, IDAS shall be implemented as an armament system for the new submarines in order to provide defence against antisubmarine helicopters.

Branch K4.3 deals with aircraft-based missiles for the engagement of air targets. Currently, this concerns the projects METEOR, IRIS-T, AMRAAM and SIDEWINDER. ME-TEOR is implemented within the context of a European cooperation under British command. In 2016, the first METEOR missile arrived in a depot in Germany. Also in 2016, an implementation arrangement was concluded in which six nations participate and which regulates the joint use of the missile. The procurement will continue until 2019; in view of the small numbers procured so far a supplementary procurement will be prepared from 2020 onwards. The IRIS-T short-range air-to-air missile is currently in

use. The project was implemented under German command within the framework of a cooperation program in which six nations participate. Considerations for a further development that is based on the threat's development have already begun. Branch K4.4 deals mainly with the PATRI-OT projects and products as well as with the Surface-to-Air Missile Operations Centre SAMOC. With regard to PATRIOT, focal points are the control of in-service support for systems fielded into the Bundeswehr and the associated challenges concerning the elimination of obsolescence effects as well as necessary adjustments to new operational scenarios. The SAMOC provides the capability to connect individual systems and higher operations centres and to establish a joint situation picture.

Branch K4.5 is responsible for the shortrange surface/air weapon systems Mantis/NBS C-RAM and the light air defence system (including the STINGER guided missile). Currently, the preparation of the capability gap and functional requirement document "Air Defence System for Protection in the Short Range and Very Short Range" and "High-Precision and Scalable Effects against Agile and Low-Signature Targets in the Short and Very Short Range of Seaborne System-Carriers of the Navy" and its subsequent implementation into projects is the main focus of Branch K4.5.

Division K5 "Armoured Combat and Transport Systems" is divided into the following branches:

Currently, the main focus of K5.1 is on the modernisation of altogether 104 LEOPARD 2 main battle tanks to the most recent LEOPARD 2 A7 version. The modernisation comprises product improvements such as the improvement/extension of the cooling system inside the turret and the chassis, the integration of a new thermal imaging device, the exchange of the drivers' night vision devices, the integration of an eye-safe laser and improvements in terms of chassis protection. Moreover, K5.1 deals with vehicles of the LEOPARD 1 fleet (BIBER, DACHS, ARV 2 LS) as well as with the armoured engineer vehicle project (successor of the AEV DACHS).

Branch K5.2 has reported about the PUMA armoured infantry fighting vehicle several times. Another focus is on the planned service life extension of the MARDER armoured infantry fighting vehicle.

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The PARS 3 LR, MELLS, WIRKMIT-TEL 90 and the future WIRKMITTEL 1800+ projects represent the main activities with regard to anti-tank defence. The picture shows one of the possible candidates for the WIRKMITTEL 1800+, the ENFORCER.

Branch K5.3 "Heavy Weapon Carriers/Armoured Transport Vehicles" deals with the BOXER multi-role armoured vehicle and the FUCHS 1 armoured transport vehicle. In the BOXER MRAV project, the procurement of the second lot of 131 armoured personnel carriers and the upgrade of the vehicles in stock to the A2 design status constitute the two current main tasks. Within the framework of the FUCHS 1 ATV project the contract on the second lot of the project "Product Improvement of the FUCHS 1 ATV Protective Properties" was concluded. With this second lot, further 90 vehicles will be upgraded, in particular with regard to their level of protection.

The main focus of the work conducted by Branch K5.4 is on dealing with the extensive in-service support tasks of the FENNEK weapon system which is currently in use both in Mali and in Afghanistan.

A further 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, the construction of a system and function demonstrator "Airmobile Weapon Carrier" as a replacement for the WIESEL 1 fleet from 2025 onwards as well as on the successor system for the BV 206 S and D vehicles.

The branch in charge of Bridges and Crossing Equipment, which was formerly assigned to K6, has in the meantime been incorporated into Division K5 – while its responsibility remains unchanged – and has traded its name and number with the former Branch K5.5 Medium Calibre/Weapons. Common to K5 is the main special field of Automotive and Equipment Engineering. The task spectrum of Branch K5.5 comprises bridges, ferries, footbridges and light crossing equipment and also the systems which are closely linked to them in terms of functional dependencies, namely systems designed to improve the trafficability of soils like the folding trackway. One particular feature of this Branch is that it also calculates and determines the Military Load Classes (MLC) of Bundeswehr vehicles.

Apart from the successful control of in-service support for a large number of different and somewhat outdated systems, another task focus is on the integrated compliance demonstration that has just started for the "assault bridge - armoured bridging system." In view of the Alliance commitments within the NATO Enhanced Forward Presence mission, the realisation of the successor system for the BIBER armoured vehiclelaunched bridge, which has been in use for more than 40 years, is governed by a step-by-step and extremely ambitious time schedule. This new army system, which consists of a launching vehicle, different bridges and the transport system, has already been presented in this journal.

Division K6 deals with small and large calibre guns of the Bundeswehr, including their corresponding ammunition.

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 fielded in five other nations. International logistic support is provided by the NATO Support and Procurement Agency (NSPA).

As modernisation measures the integration of a new on-board intercommunication system with active sound insulation is being prepared as well as the development of a more efficient on-board computer that can, among others, ensure firing of the planned VULCANO guided ammunition.

A new 60mm mortar system will close the capability gap within the spectrum of effects between the JFS systems on the one hand and the direct fire infantry weapons on the other hand and will operate within a range of up to 3500 metres. It shall take into account the mobility of forces deployed in an infantry role, which creates special requirements on transportability, transport and handling.

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

Since the G36 will not be improved and a new product will not be developed, the decision was taken to field a commercially available product.

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

The main focus of the coming year's work will be on the integration of the MG 5 into different gun mounts, the supplementary procurement of the automatic grenade launcher and heavy machine guns, the preparation of the MLG product improvement and the development of technical solutions for the above mentioned 40mm airburst and the 30mm ammunition with reduced range.

This year, it is also planned to establish a Navy gun systems cell. It will pool all Navy guns from 12.7mm to 127mm under a single project manager to create synergies.

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

The FUCHS KAI ATV project improves the capability of mechanised explosive ordnance and IED disposal from a protected position, in particular in the vicinity of roads and infrastructure (buildings, bridges). At present, the first systems are at the Bundeswehr Technical Centres for compliance demonstration. After successful completion the delivery of the series systems is scheduled to begin. The procurement of large-calibre tank, artillery and mortar ammunition is carried out by Branch K6.5.

Relevant ammunition will, by means of regeneration, always be adapted to the state of the art and the operational requirements and will be fielded upon completion of the risk reduction phase.

Currently, the fielding of guided artillery ammunition in the Army and Navy is being prepared. In the field of naval ammunition this will be ensured by the 127mm VULCANO ammunition for joint fire support by the F125 frigate from sea to land. In addition, the unguided 127mm standard ammunition is currently being qualified.

For the Army capability of point target engagement, the VULCANO 155mm GPS/SAL (Semi Active Laser) ammunition is intended for use with the PzH 2000 self-propelled howitzer; its demanding qualification is currently taking place, among others by trial campaigns in South Africa.

Air Directorate (L)

The Air Directorate of the Federal Office of Bundeswehr Equipment, Information Technology and In-Service Support (BAAINBw) manages military aviation projects at national level. It is responsible for realising the projects and supervising the fielded products until their disposal, all in accordance with the procedure of the amended Customer Product Management (CPM (amended)). The Directorate has seen a build-up of posts in 2017 as a consequence of the "Reversal in Personnel Trends", resulting in a total number of posts of approximately 1,000.

Managing airborne systems 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, state-of-the-art helicopter systems, tried and trusted older systems in use (including the challenges arising with the older age), unmanned aircraft, tactical drones, and space-based reconnaissance systems to rescue and protection systems for the crews, simulators, and training equipment.

Nearly all large-scale projects are realised in multinational, predominantly European, partnerships and management agencies. The Air Directorate attends to the assigned (weapon) systems throughout their entire life cycle in the form of life cycle management in accordance with the CPM (amended) prior to the realisation through

- applied basic research and user-focused defence research and technology (R&T levels 1 and 2) as well as system and solution-oriented studies (level 3),
- partaking in analysis phase I by contributing to the field of planning and
- preparing suggested solutions in analysis phase II,

and throughout the implementation and in-service support phase through

- managing and supervising all projects relating to manned and unmanned aircraft as well as space-based reconnaissance systems of the Bundeswehr,
- supervising the system engineering and the integration of subsystems, including armament,
- life cycle management including obsolescence management and
- risk management.

This also includes highly prioritised procurement in the context of "fast-track initiatives for operations".

The organisational structure of Directorate L is geared towards its tasks and responsibilities regarding flying equipment as well as other related products (e.g. subsystems, ground equipment, accessories, etc.): **Division L1** – Economic and Technical Affairs, Policy/Fundamentals of A/C, Aeronautical and Non-Essential Equipment – has five branches currently working on cross-sectional and multi-project tasks of the Directorate.

Branch L1.1 assumes tasks relating to defence research and technology (R&T levels 1 and 2) within the Air and Space Systems Integrated Planning Process (IPP) and takes care of the IT support for Directorate L as well as further cross-sectional tasks. Branch L1.4 assumes 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 docu-



EUROFIGHTER with air-to-ground armament

functional area 30 in a national as well as international context (e.g. EDA or NATO). 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 Centre for Aircraft and Aeronautical Equipment (WTD 61) in Manching. Additionally, the following tasks will be dealt with by this Branch in the future: 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. This Branch also coordinates the contributions within the framework of the mentation 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 con-



AESA radar



The EUROFIGHTER programme is Europe's largest armament project.

ducts 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 above-mentioned spectrum across their entire life cycle. The Divisions' responsibilities are as follows:

Division L3 is responsible

• in Branch L3.1: for transport and special aircraft

(C-160 TRANSALL, C 130J HERCULES, Airbus A310 MRTT, A330 MRTT within the framework of the multinational MRTT fleet – MMF, A319CJ including the "Open Skies" version, A321, A340 and Bombardier GLOBAL 5000), as well as aerial target presentation,

- in Branch L3.2: for long-range maritime patrol and maritime surveillance aircraft P-3C ORION and DO-228,
- in Branch L3.3: for the TORNADO weapon system,
- in Branch L3.4: for rescue, special flight and parachute systems as well as
- in Branch L3.5: for aviation aspects in the current regulatory context and flight safety. In this connection, the performance of duties of a holder of the military type certificate is worth noting. This Branch 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.)

Division L4 is the responsible authority for all helicopters/rotary-wing aircraft that are in use or are supposed to be used in the future in the Bundeswehr's Army, Air Force and Navy as well as in the organisational area of Equipment, Information Technology and In-Service Use. Division L4 currently consists of four branches that are working on the overall realisation and materiel responsibility for operational viability of the following helicopter systems:

Branch L4.1 is responsible for the fielded transport and multirole helicopters CH-53, AS 532 U2 COUGAR VIP helicopters (VIP transport of politicians and parliamentarians), BO-105, Bell UH-1D, EC 135, Light Transport Helicopter (in the SOF und SAR versions), Basic Training Helicopter, and the future Heavy Transport Helicopter (successor to the CH-53 system). The CH-53 Medium Transport Helicopter will be employed for personnel and materiel transport as well as for special tasks. Different series of the Medium Transport Helicopter have been in use in the Bundeswehr since 1975; this aircraft still is an indispensable and valuable system in the Bundeswehr operations. The CH-53 helicopter will be further used and subjected to on-going required modernisation measures, until it is succeeded by the Heavy Transport Helicopter successor.

Branch L4.2 is responsible for the SEA KING MK 41 and SEA LYNX MK 88A weapon systems fielded in the Navy. The SEA KING MK 41 is an all-weather capable helicopter that is proving its worth on a daily basis; it supports the fleet by serving as a link between land and sea as well as by providing search and rescue services. The SEA LYNX MK 88A helicopter acts as an extended arm of the ship, considerably enhancing the ship's capabilities by its range, speed and flexibility. The aircraft is equipped in accordance with its principal role as an antisubmarine helicopter.

On board of Bundeswehr frigates, the MK 88A weapon system also takes part in Bundeswehr operations abroad. The SEA KING Mk 41 contributes significantly to the military search and rescue services of the Bundeswehr.

Branch L4.3 is responsible for the TIGER combat helicopter, a multinational project between France, Spain, and Germany. Apart from engaging main battle tanks, the Bundeswehr employs TIGER to ensure the following tasks within its extended operational spectrum: support of airmobile operations and ground troops, security and convoy escort, armed reconnaissance, and engagement of high-value targets. Since UH TIGER was originally designed to operate in Central Europe, special adjustments had to be made on the helicopter prior to



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its employment in Afghanistan. The new version of the helicopter that arose out of these changes is called ASGARD (Afghanistan Stabilisation German Army Rapid Deployment) and is equipped, among other things, with engine sand filters, improved ballistic protection, and a fourth radio set for satellite communications. The development of the ASGARD helicopter began in 2011 and was completed in time for the mission abroad in Afghanistan. The TIGER combat helicopter was and is currently employed in Bundeswehr operations abroad. Branch L4.4 is responsible for the multinational NATO-Helicopter (NH) 90 helicopter programme. More than ten nations take part in this programme, with a total number of over 500 ordered helicopters up to now. Germany is procuring a total of 100 NH90 for Army and Navy.

Two baseline versions were developed on a common basis. They are each geared towards operation over land or ship-based operation in a maritime environment. The Army will employ the NH90 TTH (Tactical Transport Helicopter) mainly for tactical transport as well as search and rescue operations. Special conversion kits can be used as required for flights over water, self-deployment across large distances as well as air escort and self-protection roles. The Navy will employ the NH90 SEA LION mainly for tasks regarding tactical transport of personnel (including special and specialized forces) and materiel, maritime surveillance, military and civilian search and rescue on sea, (medical) evacuation, and boarding. The NH90 SEA LION will be used in ship-board as well as land-to-sea operations. The NH90 TTH Army version is currently used in Bundeswehr operations abroad.

Division L4 is one of the largest and most complex divisions in the Project Division Air, with several helicopter systems in operation, extensive in-service support tasks, and interfaces to all armed services of the Bundeswehr.

Division L5 is responsible for Air and Space-based Reconnaissance Systems and Aircraft EW.

Branch L5.1 is in charge of the project management for unmanned aerial vehicles (UAV) of HALE- and MALE-classes, e.g. HERON 1 in Mali and Afghanistan, and HERON TP for imaging reconnaissance, as well as of the PEGASUS HALEproject for airborne, wide-area SIGINT. The realisation and materiel responsibility



Take-off for night flight

for the Bundeswehr tactical UAVs lies with Branch L5.2. Apart from the Army systems in use so far, the VorMUAS project is the first undertaking to realise the capability of organic, tactical overhead reconnaissance with UAVs for the Navy. A joint UAS mR (Unmanned Aircraft System, middle-range) successor system with extended capability spectrum is realised on the basis of LUNA NG for the KZO and LUNA systems.





Branch L5.3 takes on the tasks relating to Space-based Reconnaissance Systems. This includes the currently in use SAR-Lupe radar satellite system, for which the Bundeswehr cooperates with France, as well as the SARah satellite system (successor system to SAR-Lupe), currently in its realisation phase, for which the Bundeswehr also cooperates with France and Sweden. The tasks of the branch also involve the work with the SaLuBAA Satellite and Airborne Imagery Exploitation System.

Branch L5.4 is responsible for the reconnaissance and EW systems of all airborne weapon systems. Its field of work ranges from reconnaissance sensors, evaluation stations and information systems to decoys, warning systems and jamming and deception devices to the support systems required for operation as well as the continuous improvement of the self-protection of airborne weapon systems.

Division L6 is responsible for the management of the EUROFIGHTER fighter aircraft. The given example contains further details.

Division L7 is responsible for the management of the A400M transport aircraft. The following partner nations take part in this international project which is managed internationally via the OCCAR agency (Organisation Conjointe de Coopération en matière d'Armement): Great Britain, France, Spain, Turkey, and Belgium/Luxembourg. Manufacturer of the aircraft is AIRBUS.

Branch L7.1 takes care of financial planning (for investment measures as well as measures for material maintenance), project planning, risk management, calculation of life cycle costs, quality of the weapon system, and basic issues regarding the A400M certification. Tasks from more specialised areas also form part of this Branch's work, such as acceptance of aircraft, preparation of approvals for service use, compliance demonstration (as a supplement to the contractually agreed compliance demonstration of the industry), and IT security. Branch L7.2 is responsible for the system management of the A400M overall system and the respective ground support systems. This also includes the technical-operational coordination and evaluation of ca-

pabilities, development activities, and qualification results within a national and international framework as well as the realisation of supplemental capabilities that enhance the performance of the overall system, all geared towards the benefit for the troops (e.g. medical evacuation, capability of night-vision flight).

The system is additionally realised as an individual project in Branch L7.2 for the extended selfprotection of the aircraft (directed infrared countermeasures – DIRCM).

The responsibility for the areas integrated logistic support and tasks of in-service support lie with Branch L7.3. The following subjects form part of the work in the framework of "Integrated Logistic Support": training, ground equipment and special tools, materiel management, technical documentation as well as ground support systems (operations control and mission planning system specific to the weapon system).

The tasks within the framework of the in-service support materiel responsibility include, among other things, contractually ensuring the performance required for operation and logistics of the German A400M fleet. On top of that, the cooperation with the international armaments agency OCCAR and the cooperation with the A400M partner nations are coordinated and designed on technical-logistic support level.

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 nations (DEU, GBR, ITA, ESP). Delivery of



AIR 🗖



Turning flight

the 143 aircraft ordered by DEU began in early 2003 and will last until 2019.

The export nations Austria, Saudi Arabia, Oman, Kuwait and Qatar, in addition to the NATO programme nations, use the EU-ROFIGHTER weapon system or have initiated its procurement.

The operational tasks of the Bundeswehr also require newly implemented 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 at the end of 2017, the Guided Bomb Unit (GBU) 48 air-to-ground weapon can be used with precision against targets on the ground with the help of the LITENING III laser target marker. The Bundeswehr provides this air-to-ground role for possible operations within the scope of NATO since 2018. The Operational Developments in Time for NATO (ODIN) subproject was established in order to bundle the contributions that are needed for this purpose. The priority was to implement the delivery services from national and international contracts and coordinate them in such a way that they could 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 AMRAAM (AIM: Air Intercept Missile, AMRAAM: Advanced Medium-Range Air-to-Air Missile). 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 all-weather 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 buildup 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 EUROFIGHT-ER's tactical-operative 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 are provided by the respective "EUROFIGHT-ER Partner Company (EPC)" in each country since August 2016.

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.

Sea Directorate (S)

The Sea Directorate is responsible for all matters related to the realisation and in-service use of Navy ships and boats, Navy-specific shore-based systems, communication systems, training installations and other Navy-specific equipment.

The Sea Directorate supports the units from the first stages of realisation to the disposal of decommissioned units and their subsequent handover to the disposal organisation. Thus the Sea Directorate is responsible for maintaining and restoring the operational maturity of the products assigned to it and therefore bears the materiel responsibility for these products "from the cradle to the grave".

The Sea Directorate consists of a total of six divisions, each with a different focus of activities, and of the Directorate Staff and 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 are in charge of "integrated project teams" in 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, training installations and operational training centres 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 following is a representation of the current status of selected projects of the Sea Directorate:

Obsolescence Elimination of the Long-Range Sensor and Capability Enhancement of F124 in Air Defence (Obs WuF LV F124)

With its three F124 class frigates the German Navy operates ships specifically designed for force air defence and joint air



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Class F125 frigate BADEN-WÜRTTEMBERG entering the port of Wilhelmshaven

defence. The main sensor for generating a large area air picture is the SMART-L air surveillance radar, which is, however, increasingly affected by obsolescence.

The main aim of the project "Obs WuF LV F124" is retaining the F124's air surveillance capability by eliminating the obsolescence of SMART-L. Additionally, the F124 will be enabled to contribute to NATO Ballistic Missile Defence (BMD) in a manner that reflects Germany's leading role in Cluster Air and Missile Defence (AMD) in the fields of early warning and slew-to-cue.

Obsolescence management and the required capability enhancement of F124 in the field of air defence will be based on commercially available technology in accordance with the selection decision made by the Chief of Defence in December 2016.

In order to be able to make a meaningful contribution to NATO BMD or the US-European Phased Adaptive Approach (EPAA) the entire functional chain from the sensor on F124 to a missile (e.g. SM-3 as interceptor) used by a different ship (such as a US destroyer) must be taken



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into account. This also requires adaptations to the tactical data link (TDL) segment and the IFF system.

In order to keep the required adjustments to the Combat Direction System (CDS) F124 to a minimum and thus as low-risk as possible, the intention is to develop a separate "ballistic missile defence" module and integrate it in the CDS F124. Apart from the three ship systems, in order to minimize risk, a test and reference system for land-based testing and demonstrations is to be set up in Parow and later also used as a training facility.

Currently BAAINBw is preparing the contract award documentation with the aim of producing the required statement of work by mid-2018. The contract for the upgrade of the three F124 is to be concluded by the end of 2019 and the aim is to start the upgrade in 2025.

Class 125 Frigate Project

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 stabilization 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 Thyssen-Krupp Marine Systems and Fr. Lürssen Werft, builds the vessels. The first ship of this class, the frigate BADEN-WÜRT-TEMBERG, 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 was successfully completed in July 2016. The trials for the combat system now involve a military crew and are scheduled to be concluded by the end of the third quarter of 2018.

Subsequently the Navy will subject the BADEN-WÜRTTEMBERG to operational suitability testing over a period of twelve months.



Class 123 frigate BRANDENBURG at sea

The other ships will be at the Navy's disposal by the spring 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 as the third ship.

Corvette K130 2nd Batch

With the 1st K130 batch, a very modern, highly complex weapon system with high technical standards was procured. The initial defects in some components such as the gearing or the air-conditioning were successfully corrected some time ago.

The Navy's current and future requirement for additional maritime platforms is explained by increasing operational commitments while the availability of naval platforms is decreasing.

This requirement is met by the procurement of five more K130 corvettes. The realisation risk is minimised by continuing the successful corvette K130 concept.

The tried and tested basic design of K130 will be retained during the procurement of boats 6 to 10. Thus, the supplementary procurement of boats 6 to 10 is the most economic and efficient solution:

- new surface vessels will be commissioned in the near future,
- compared to a new design it is more cost-effective and available sooner,
- it reduces the realisation risk that a system this complex would carry and
- it uses synergies within the Navy; only a high degree of system commonality will permit the use of existing training

assets (personnel and infrastructure) and an identical logistic chain.

For a future-oriented in-service use for a further 30 years the obsolescence which have occurred after a 10-year service life must of course be eliminated, and adjustments must be made to comply with the currently valid laws, regulations and standards.

Taking these requirements into account, the construction contract with ARGE K130 was signed on 12 September 2017. Boats 6 to 10 are planned to be commissioned from 2022 onwards.

Class 123 Frigate – Measures to Maintain Operational Maturity

The four BRANDENBURG-class frigates (F123), planned in the 1980s and commissioned by 1996, are now the backbone of the surface units with command and control capability of the German Navy. They have proved their worth in numerous international operations.

The principal factor crucial to design in order to maintain operational capabilities is 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 order to maintain operational maturity up to the end of their service life, which has now been set for 2030, further extensive measures are required to eliminate obsoles-



cence due to the frigates' age and the age of the on-board systems.

The focus of the measures taken to maintain operational capabilities is on tactical radars, fire control systems, the integration of RAM Block 2 and HARPOON but also the modernisation of marine automation systems. The combined implementation of these measures will be conducted during scheduled maintenance intervals in the coming years in order to use synergy effects and resulting financial planning in order to maintain a high level of operational availability.

Current Project Status of MJ 332 CL Conversion

With the MJ 332CL project the weapon system IMCMS / SEEFUCHS¬ developed by ATLAS Elektronik GmbH and already in service on five MJ 332 class boats will also be installed on the three mine hunters of this class which are currently still equipped with the mine hunting drone PINGUIN B3. The three vessels intended for conversion will also obtain the capability to control the surface drone SEE-HUND currently installed on the class 352 vessels. The conversion of the first boat, MJ 332 GRÖMITZ, was started in December 2017 and is planned to be completed by the beginning of 2019.

A training and test facility (APA IMCMS) where simulator-aided training of naval mine countermeasures will be possible will also be procured in the context of the project. The infrastructure measures will begin in the autumn of 2018 and they will

be concluded by the time the equipment is installed, in November 2019. The image below shows the schematic structure of the system.

Both the boats and the training and test facility will fulfil the IT security requirements for processing classified data and will be accredited accordingly.

Support Units, Auxiliaries, Support Systems

The project and in-service management performed by Branch S5.1 for the three combat support ships, the three intelligence collectors and the six tenders focuses on the sustainable maintenance of these units' operational maturity by regular repairs and extensive investments and logistic measures. The extremely old age of many of these units requires extensive midlife-measures and obsolescence elimination. This includes the propulsion systems and electric power generators of tenders and intelligence collectors, as well as the successful regeneration of the entire ship automation and the on-board cranes on the 1st batch of CSS, which is currently being conducted. The integration of the new Navy helicopter SEA LION and the replacement procurement of the



As a reliable partner of the German Navy for almost 50 years, Hagenuk Marinekommunikation GmbH (HMK) has supplied systems and equipment deployed on board of all vessel classes. The latest systems operating successfully with HMK integration are the U 212 A 2nd batch class submarines, the K130 class corvettes, 1st and 2nd batch and the joint support vessel EGV Bonn.

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Training and test facility IMCMS

integrated mobile naval surgical hospital (MNSH) on the combat support ships are further priorities. Apart from these longterm projects, short-term requirements are also constantly being realised, such as the enhancement of CSS FRANKFURT AM MAIN in order to give it the command capabilities required for "NATO support AEGEAN".

Branch S5.3 deals with project and inservice support management for the auxiliary and support units and the defence fleet. It is also responsible for the sail training ship GORCH FOCK and the research vessel PLANET as well as harbour tugs, accommodation vessels, oil barges, diver training vessels or replenishment oilers. The large number of units and their old age requires intensive support particularly in the field of maintenance. Obsolescence elimination in technical facilities and equipment as well as processing of product modifications are part of the daily routine.

Apart from in-service support management tasks, Branch S5.3 is also responsible for technical issues concerning small watercraft and their launching devices as well as their procurement. In essence this comprises the generation change in fast rescue boats on frigates, tenders, combat support ships and the Navy training facilities. At the same time, solution proposals for the procurement of two new replenishment oilers which are to replace the current 704 class replenishment oilers (RHÖN and SPESSART) are being developed.

Integration of Rolling Airframe Missile (RAM) Block 2

TheRAMguidedmissileisdesignedforpoint defence against air and surface targets. It is upgraded regularly in the bilateral US-German RAM program. The missile in its current Block 2 version will guarantee the self-defence capability against modern anti-ship missiles. The combat direction systems of the ship classes already in use are being adapted so that the current Block 2 version of the missile can be fired. This concerns the class 130 corvettes (K130) and the class 123 (F123) and 124 (F124) frigates. The ship classes currently being built, the F125 and MKS180, will be equipped with RAM Block 2 from the outset. For the purpose of efficient maintainability, the software developers focus on the best possible universal use and up-to-date quality standards when designing and adapting the software. For this purpose, parts of a software testbed were commissioned for K130 and will also be used for subsequent system modifications in other projects in order to guarantee a continuous level of quality.



Land Support Directorate (U)

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

he spectrum ranges from individual equipment for Special Forces over military camps, medical equipment, CBRN protection, military wheeled vehicles, special vehicles and equipment up to EW (electronic warfare), reconnaissance, air traffic control, robotics and training/simulation. In addition, the Land Support Directorate exercises the general functional supervision over the Bundeswehr Technical Centre for Automotive and Armoured Vehicles (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.

Similar to other directorates in which project work is carried out, the core tasks of the Land Support Directorate include:

- project management in accordance with the amended CPM (Customer Product Management) procedure throughout the entire life cycle of the materiel, systems engineering and integration,
- research and technology,
- technical support during in-service use, and
- contract management and price negotiations.

Compared to other directorates in which project work is carried out, specific characteristics of the Land Support Directorate are:

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

The U Directorate is supported by the Directorate Staff (UAS) and the Directorate Controlling (UAC).

Project work is done in five project divisions with altogether 21 branches, and they receive support from the **Economic and Technical Affairs (U1) and Economic 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. The U1 Division with its four Branches serves as the Directorate's central point of contact for the following:

- U1.1 Interdisciplinary and cross-project tasks, Service use situation coordination center
- 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 negotiations for the project divisions, and is organised as follows:

- U2.1 to U2.4 Contract management for project divisions U3 to U7
- U2.6 Price negotiations

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

- U3 Camp technology, camp protection and supply, CBRN protection, Mountain infantry and Military Police equipment, Special forces individual equipment
- U4 Protected and unprotected wheeled vehicles, Special vehicles & equipment, Integration, Protection, R&T processing
- U5 Electronic warfare, Reconnaissance, Air traffic control, Identification, Media technology
- U6 Training technology, Simulation, Robotics
- U7 Military pharmacy, Medical treatment facilities and medical equipment

The following will provide an overview of selected projects of the Directorate.

Future-Oriented Power Supply on Operations

For both the civilian and the military sector, it is very important that the supply with electrical power is stable. In the Bundeswehr, this even plays an important role for operations. When designing an electrical power supply system, the ideal case for an optimal system would be to have a constant, planned power output of an auxiliary power unit over a typical period of time (24 hours combat day). This theoretical service use profile, however, hardly ever



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D-40213 Düsseldorf Germany Tel. +49 211-8 48 00 Fax +49 211-32 90 00 renka-export@web.de **renka-export.com** corresponds to the conditions in reality, especially against the backdrop of permanently changing operating conditions. Electrical energy is mostly needed in different amounts and at various points in time that cannot be scheduled in advance. It must therefore be concluded that the selection of the auxiliary power unit must be based on the expected peak load and that the auxiliary power unit must be operated continuously in order to supply power when it is needed.

This approach inevitably leads to the use of powerful auxiliary power units so that any peak load can be met. Afterwards, such units operate in off-peak mode (<30% utilisation of the unit) up until the next peak load. Apart from the inefficient fuel consumption in off-peak mode and all sorts of emissions that are connected with this type of operation, such operating conditions also cause considerable costs. The time metre of an auxiliary power unit does not differentiate between "efficient" (approx. 80% utilisation of the power unit) and "inefficient" operating hours (in offpeak mode).

There are commercial solutions to increase efficiency which could also be used in the Bundeswehr. Basically, such a system consists of an electrochemical energy storage device (battery) and power electronics with several interfaces (in the following referred to as hybrid energy module (HM)) that is installed between the auxiliary power unit and the load.

In this baseline configuration, the HM is charged by the auxiliary power unit in its optimum operating window until the batteries are full. Then, the HM automatically switches off the auxiliary power unit and supplies all electrical loads with zero-emission power until the batteries need to be recharged; this is also effected by the HM, which automatically switches on the auxiliary power unit again.

If, in addition to the baseline configuration, several energy sources are to be used, this can be achieved by a number of supply interfaces at the HM. Apart from using another conventional supply source (electrical energy from existing infrastructure or from electrical systems with low availability), there is also the possibility to feed in energy from photovoltaics or wind energy. In this configuration, power for the HM mostly comes from "alternative" energy sources connected to the interfaces.

A powerboost function of the HM makes it possible to temporarily combine the out-

puts of the HM and the connected auxiliary power unit for unplanned peak loads. In any case, the auxiliary power unit will only be started when its batteries are empty, or in the event of an unplanned peak load.

By integrating the HM into the existing configurations of auxiliary power units and loads, it will not only be possible to achieve almost the ideal case described earlier, but also to implement additional functionalities, which can be summarised as follows:

- reduction in operating costs and increase in availability by reducing the operating time of the auxiliary power unit
- minimising all types of emissions and signatures
- saving fuels and lubricants, friendly to the environment
- reliable, uninterruptible power supply and functionality to serve as a replacement for the power grid
- use of smaller auxiliary power units thanks to a powerboost function and overload capability
- emergency mode without fuel is possible when using alternative energy sources

In view of the substantial technical-economic advantages it is planned to field the technology described above in the Bun-



deswehr for the first time in the medium term (for example in the context of procuring new range safety monitoring vehicles for training areas).

Protected and Unprotected Wheeled Vehicles

The U4 project division with its five Branches is responsible for the procurement of protected and unprotected wheeled vehicles and for establishing their operational maturity. The spectrum ranges from command vehicles and functional vehicles over transport vehicles, tank cars and fire brigade vehicles up to engineer construction equipment up to recovery and loading vehicles. The total number of such vehicles within the Bundeswehr is approx. 56.000, of which a good 51.000 fall into U4's area of responsibility. The U4 Division thus makes a substantial contribution to mobility, both protected and unprotected, and especially to operations worldwide.

In the context of the current project concerning unprotected transport vehicles of the military load class from 5 to 15 tonnes, the category I (Cat I) military trucks that were fielded in large numbers in the mid-70s are going to be replaced. These highly



A reconnaissance company on operations in the Malian desert with the BOR-A system as part of the MINUSMA mission

mobile military vehicles are very valuable in terms of operational use thanks to the installed command and control equipment, the communication systems, the protective equipment (jammers), the remote-controlled weapon station, and because it is possible to replace the unprotected cab by a protected cab. This takes full account of the ideas expressed in the principle "train as you fight". The contract concluded with Rheinmetall MAN Military Vehicles GmbH (RMMV) provides for a first-batch delivery of 339 trucks with a load class of at least 5 tonnes [Figure 1] and 219 trucks with a load class of 15 tonnes [Figure 2]. The form of contract used here, however, is new. Provided that budgetary funds are available, it will now be possible to have additional

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RASIT armoured reconnaissance radar during an exercise in Munster

vehicles of the same manufacturer delivered at any time up to the approved total number.

The projects concerning a protected mobile crane and a protected recovery and crane vehicle [Figure 3] should also be mentioned. Two contracts could be concluded in June 2017 with Liebherr-Werk Ehingen GmbH concerning the manufacture and delivery of 38 protected mobile cranes and 33 protected recovery and crane vehicles.

The mobile cranes and the recovery and crane vehicles are to be used in a missionspecific manner, and especially worldwide. By contrast to commercially available mobile cranes with a focus on maximum crane performance, the protected mobile crane and the protected recovery and crane vehicle have been designed to meet the Bundeswehr-specific user requirements for a balance between recovery and crane performance, crew protection, and mobility.

The protected mobile cranes are intended for lifting and moving heavy and bulky loads high up across a large lift radius, for example in the context of camp installation and operation, or when setting up modular medical facilities.

The protected recovery and crane vehicles will mainly be used for the recovery and towing of vehicles that broke down or became stuck. Although the protected recovery and crane vehicle has been optimised for many protected wheeled vehicles fielded in the Bundeswehr, it can also be used for the recovery and towing of other unprotected wheeled vehicles.

The delivery of both vehicle types constitutes a capability gain in qualitative terms for the armed forces.

The tasks of Division U4 further include the safe integration of complex conversion kits into vehicles that fall into its area of responsibility. One example in the context of this task relates to the seating systems of unprotected and protected wheeled vehicles of the Bundeswehr. Up to now, personal protective gear had to be taken off in the vehicle before it had to be put on again in a complicated way in the vehicle prior to leaving it. The aim of an R&T study is to qualify several seating systems which allow that personal protective gear can also be worn in the vehicle.

Ground-Based Reconnaissance and Area Surveillance System

One subdomain of the portfolio dealt with by the Division U5 "Electronic warfare, reconnaissance, air traffic control, identification" is characterised by the manifold opportunities of radar technology use. Within the radar technology "Tactical air command and control service, identification/IFF and ground-based radar reconnaissance", the main focus is on the radar systems ABRA, PARA, COBRA, LEGAR and BOR-A. They form the core of the portfolio dealt with in the domain "Ground-based radar reconnaissance".

With the PARA, LEGAR and BOR-A systems, the (armoured) reconnaissance forces of the Army are provided with very reliable systems. Some of them, however, are also quite old. The PARA system in particular, which was fielded in 1985 in 110 systems, is increasingly difficult to handle in terms of spare parts supply. The situation for artillery is guite similar: Of the total of 63 ABRA systems procured since 1977, the artillery forces still operate 17. The radar set was updated in the mid-90s due to obsolescence effects. Compared to the systems currently available on the market worldwide, both PARA and ABRA are outdated systems that can no longer be supported logistically.

This situation was dealt with at an early stage, both in technical terms and with regard to planning. In the BÜR development project, prototypical evidence has already been provided in 2010 that a powerful radar, fully integrated into the vehicle, can by and large meet the requirements of both armoured reconnaissance and artillery forces. Due to changed political and structural boundary conditions, this project was no longer pursued, however. As a result, the ABRA and PARA systems had to be kept in service. In the following years, it became evident that systems such as BOR-A are perfectly suited for changing mission spectrums because they are not firmly integrated into a vehicle.

On the basis of this finding, BAAINBw was tasked in 2015 to draw up possible solutions for the final functional requirement (FFF) regarding a "ground-based reconnaissance and area surveillance system", BARÜ for short. The selection decision in order to cover the demand using commercially available products has meanwhile been taken and a statement of work has been prepared. It is expected that the new BARÜ system will be fielded from 2021 onwards. As a result of the fact that the number of LEGAR and BOR-A systems is low, the continued use of the ABRA and PARA systems, which will then have exceeded their originally planned in-service life by almost 20 years, constitutes the single opportunity of the armed forces to maintain capabilities - a more than exciting challenge from the perspective of in-service support management. This is critical insofar as a capability loss through the discontinuation of systems would make it much more difficult to regain the competence of radarbased reconnaissance for the German Army.

Information Technology Directorate (I)

Information technology, the Internet and therefore also information security play an increasingly important role not only in our daily lives, but also in politics. Manipulated elections, for example, would be a disaster for democracy. It was probably a stroke of luck that experts from ZEIT ONLINE discovered security holes in the voting software shortly before the Bundestag elections. This example shows that it is essential for Germany to protect itself against threats from cyberspace, and the Bundeswehr must contribute to this together with other institutions.

So far, the Bundeswehr has already ac-quired a great deal of expertise in the IT sector, but know-how was dispersed over all the important organisational elements. That has now changed; Bundeswehr expertise in Cyber Services/IT has been bundled in a new military organisational element, the Cyber and Information Domain Service. While this measure was appreciated by the press, it was not clear in which way the procurement of IT and equipment for this new major organisational element will be organised.

Currently, 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 its own communications satellites. A current example for the use of products of Directorate I is a command post deployed from Incirlik, Turkey, to Al Asrak, Jordan, to ensure the safe flight operation of the TORNADOs and the A310 MRTT transport/tanker aircraft within the scope of Operation Inherent Resolve. The command post comprises 19 containers of the mobile C2 system of the German Air Force

The data link to the home country is provided via a state-of-the-art satellite ground station (SATCOMBw Stage 2).

Next to Directorate I, the following BAA-INBw directorates also deal with IT:

Directorate G is responsible for the IT support of logistic-administrative processes and implements them within SASPF (Standard Application Software Product Family); SASPF includes also the so-called systems in use.

The HERKULES special organisation (SO H) is responsible for the management of the HERKULES follow-on project and other IT projects. The HERKULES special organisation covers subjects such as workstation computers and communications networks

Products of Directorate I in operation in Jordan; top left: satellite ground station; centre: the heart of the command post with containers of the mobile C2 system of the German Air Force

in Germany, central services and IT equipment for mobile working.

Apart from the described Directorates I, G and SO H, the Combat (K), Air (L), Sea (S) and Land Support (U) Directorates as well as the Program Organization (PMO) also deal with IT. This is where the platformspecific IT in the respective projects is dealt with.

Furthermore, Directorate U has its own Division U6 dealing with training technology, simulation and robotics.

With the establishment of BAAINBw in 2012, Directorate P became responsible for the coordination of IT projects across all directorates. This is where the "Bundeswehr IT system architect" and the "IT service designer" roles were established.

IT Expertise is Concentrated in Directorate I

Just as the new Cyber and Information Domain Service is used to bundle IT skills, the BAAINBw organisation will be further developed as well. In this respect, the following principle applies: The Cyber and In-

formation Domain Service stands for Run/ Use and BAAINBw is responsible for Design/Change/Sustain. The BAAINBw core tasks - project management and materiel responsibility for operational viability – will remain within the Office also with respect to IT.

The objective of the internal, organisational further development remains to perform the tasks that are distributed across directorates in a more effective way, to overcome the artificial system boundaries between "green and white IT" and to use possible synergies. In this context, the roles of the Bundeswehr IT system architect and the IT service designer are of special importance to comply with common standards and ensure central control. With the disbandment of Directorate P, the two branches dealing with IT architecture and IT service design were shifted to Directorate I. It is expected to integrate the HERKULES special organisation into Directorate I in 2018 to have "white and green IT" under a common roof. In order to ensure that IT that is dealt with by other directorates of the Office is based on the same standards and



IT

Graphic: BAAINBM



Continued development of BAAINBw's organisation: In 2017, the IT expertise for equipment was bundled in Directorate I, thus becoming its main task.

can be integrated into the Bundeswehr IT system, the Director I has taken on a coordinating role for all directorates for the entire IT within BAAINBw.

While IT tasks in the armaments field are bundled in Directorate I as shown, tasks which are more appropriate for the Cyber and Information Domain Service were transferred accordingly (see Figure 2).

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 Bundeswehr 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 in 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, 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 and methods before and during the creation of architectures.



Test setup of the CWIX with the two test systems (black cubes) and the channel emulator (centre)

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 by means of consistent IT service orientation. This is done by holistically controlling new projects over the entire life cycle that enhance the Bundeswehr IT system and modifications to existing projects and products relating to the Bundeswehr IT system based on new IT services or IT services to be adapted. The IT service designer is responsible for gearing the IT elements used in the projects, programmes and complex services towards the goals and requirements of the IT strategy. He will advise the managers of the integrated project teams (IPT) and the project managers on the re-use of or modifications to existing IT services and, more generally, on IT ser-



The IT service tablet is a method for the comprehensive gathering of all aspects of an IT service.



vice management. Moreover, the IT service designer coordinates the IT service management with the Bundeswehr Office for Defence Planning, the German

including cloud services, in an economical fashion.

This general overview is followed by more detailed information on the individual projects.

With Full Beam into the Future of Radio Technology

The Bundeswehr will introduce softwarebased and secure radios (SDR). In contrast to previous systems, a generic radio platform (similar to a personal computer) will be used to realise the entire radio functions by loading and executing standardised software (waveform application). Keeping multiple waveforms in the storage of an SDR makes it possible to respond flexibly to mission changes without having to change the radio hardware. Modularity, flexibility and the reduction of the logistic footprint are only some of offers the opportunity to quickly implement technological approaches to test their performance capability with regard to the respective application.

Due to the close cooperation of the Fraunhofer Institutes for Communication, Information Processing and Ergonomics (FKIE Wachtberg) and Fraunhofer Institute for Integrated Circuits (ILS Erlangen), the Bundeswehr Technical Center (WTD) 81 in Greding and BAAINBw I1.1, the first increment of a flexible IP waveform with stateof-the-art capabilities (routing, prioritisation, simultaneous voice (Push-To-Talk) and data transmission, IP capability, MANET (Mobile Ad-hoc Network) capability and cross-layer optimisation) was implemented as a prototype and demonstrated within the scope of a NATO exercise after no more than one year of research work.

FLIP is a project which certainly can be designated as the spearhead of technological

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Cyber and Information Domain Service Headquarters, and the BWI GmbH as an in-house company.

As reference for the harmonisation of the service and system landscape, the Bundeswehr IT system architect and the IT service designer together develop a plan for the Bundeswehr IT system; this plan does not only contain the objectives for the IT service portfolio but also the requirements for the system architecture for the Bundeswehr IT system. The goal is to provide modern IT services, the advantages of this technology capable of augmentation. SDR only reach their full potential when using modern, IP-capable waveforms. However, the conventional development of a waveform application in line with SCA (Software Communications Architecture) requires much time and cost. In order to assess and evaluate the added value of state-of-the-art radio communications, a quick and prototypical realisation of the capabilities is more effective. The FLIP (flexible IP waveform) project takes account of this principle. It development within the field of radio communication. There is now the question of what the Bundeswehr intends to procure. This leads us to the MoTaKo (Mobile Tactical Communication) programme, in the form of a brief status update.

News about MoTaKo

The aim of the Mobile Tactical Communications system (MoTaKo) is an uninterrupted, IP capable communication network that is also interoperable at multinational level;

Source: source: Fraunhofer FKIE



Diagram of the test setup consisting of the two test systems, each with two extended test devices, all connected by a channel emulator

this network starts at the lowest tactical level, i.e. dismounted soldiers, and ends at deployable command posts. This network is intended to interconnect dismounted soldiers, vehicles and command posts at with new command and control assets; this will be performed step by step for the respective forces. According to current analysis, these forces comprise tens of thousands communications assets to be integrated

Photo: Munster Training Center



Screenshot of the IFIS C2I and weapon control system

mobile tactical level and to provide access to the respective core network for mobile elements.

Within the scope of MoTaKo it is intended to equip all formations without exceptions into all relevant vehicles for land-based operations.

Since the end of analysis phase 1, much effort has gone into basic research. The more detailed the user requirements are

documented, the better they can be evaluated and a satisfying technical solution can be found.

A system design based on open standards established on the civilian market is the key element of the possible solutions to be prepared during analysis phase 2. Since multinational interoperability is mainly characterised by the interaction with NATO partners, the MoTaKo programme organisation will also evaluate all relevant NATO standards and use them as guidelines for the system design.

Radio data transmission on its own will not offer any advantages for the user. The user requirements will always be based on what is needed for the user IT applications (apps). In order to give a detailed impression of an IT application at tactical level of the Bundeswehr, IFIS is presented as an example.

IFIS – The Integrated C2I and Weapon Control System for LEOPARD, PUMA and BOXER

The IFIS integrated C2I and weapon control system of the combat forces extends the Army's C2I system by vehicle- and combat forces specific capabilities.

The IFIS system is installed predominantly in the LEOPARD 2A7 main battle tank, the PUMA armoured infantry fighting vehicle and the BOXER armoured transport vehicle. Some DINGO and MUNGO
IT 🗖

Graphic: BAAINBM

armoured combat vehicles were also equipped with IFIS. To date, 812 vehicles and the infantryman of the future have been equipped or are planned to be equipped accordingly.

The combat forces are integrated into the command, control and information network via IFIS; in this way network enabled operations of the land forces become possible. The soldiers will be provided with detailed information of the own forces as well as real-time information about reconnoitered enemy forces. They are displayed in the situation map; thus, a uniform, level-appropriate and up-to-date operational picture is always available at all command levels. For the PUMA armoured infantry fighting vehicle especially, IFIS is a very important component for the command and control process. Since the vehicle's commander is driving and fighting below hatch and - in contrast to the MARDER armoured infantry fighting vehicle - it is not pos-



MoTaKo will unite heterogeneous communication networks to form an uninterrupted network.

sible to look out of the hatch to get an overview of the situation, the commander particularly depends on the display of his digital command and control assets. IFIS, however, also provides a benefit for the dismounting soldiers. The infantryman of the future will be connected to network enabled operations by means of the Command, Control, Computers, Communications and Information (C4I) system component and will be integrated into the information network via the





Portable command and control computer of the Future Infantryman system with situation map

PUMA armoured infantry fighting vehicle using IFIS.

For now, the IFIS system will be regularly updated to reflect the state of the art. In future, other vehicles will also be equipped with individual IFIS functionalities, such as NBC warnings, mine warnings and the connection of the weapon stations. Currently, the system's weak point is the data transmission rate; higher transmission rates are required. This short status report of the project work done by Directorate I will now be followed by a short outlook for the coming year.

Which Topics Will be of Particular Interest for this Directorate in 2018?

In the next months, it will be required to further adjust the interfaces between Directorate I, the Directorate-General for Cyber/ Information Technology in the FMoD and the new Cyber and Information Domain Service. As a result, the coordinating function of Directorate I for IT within the scope of equipment will be further fine-tuned.

Although the projects concerning the Harmonisation of the Command and Control Information Systems/German Mission Network (HaFIS/GMN) and Mobile Tactical Communication (MoTaKo) are already handled by Directorate I, this Directorate will further develop towards performing a managing role across projects and programmes. The next months will show which definitions will be made for the organisational procedures and structures in this context and which roles will be established in detail.



Information Technology Support Directorate (G)

We Digitise the Bundeswehr Processes

With the introduction of the Standard Application Software Product Family (SASPF) as part of the Bundeswehr IT system, the standard business software by SAP, SE & Co. KG and complementary software by other manufacturers was fielded for the purpose of standardising, harmonising and optimising organisational processes and procedures in the entire remit of the Federal Ministry of Defence (FMOD).

SASPF is a productive system and supports Bundeswehr operations, the operation of weapons systems and routine duty. SASPF is thus essential for operational readiness by supporting operations and exercises and all Bundeswehr activities. Apart from the actual SASPF project there are various legacy systems which have been in use for a long time and which guarantee IT

future-oriented strategy for the development of complex processes, connected projects and IT systems. They must be considered in their entirety and studied in order to be able to provide modern IT support which keeps up with the innovation cycles in IT.

The directive on the "SASPF and IT management programme" dated 1 April 2015



Business processes of the main armament process element

support for logistic and administrative processes. However, they are to be replaced successively or to be modernised as complementary products and are intended for continued use.

The Bundeswehr processes and thus the users' demands for a highly integrated IT support of the process components relevant to the users are changing continuously. On the other hand, both society and business constantly create new trends, developments or technical innovations which are relevant also for the future of the Bundeswehr and offer immense opportunities but also constitute a challenge.

Concepts such as digitisation, cloud computing, big data, the internet of things, block chain or cyber security are currently very present in the public discourse and the Bundeswehr must integrate them at an early stage in order to promote a issued by Dr. Suder, State Secretary in the FMOD, provided the instruction to generate the SASPF programme strategy. It was put into force on 14 March 2017 by the department CIO (Chief Information Officer) and director-general CIT (Cyber and Information Technology) in the FMOD.

The SASPF programme strategy is based on general policy documents such as the FMOD IT Strategy or the "Strategic Guideline on Digitisation" and provides the conceptual foundation for the further development of logistic and administrative IT support in the Bundeswehr. Its planning range for concrete measures and projects amounts to five years and it is also a budgetary document for the analysis phase of projects and studies on future topics and innovation; it will be updated once per year. The SASPF programme strategy provides instructions on architecture and on measures and projects for a modernisation of the existing IT systems and application landscape and/or the provided IT services in accordance with user requirements. In this context it takes into ¬account new user requirements for future process components, technical developments, new products by the software manufacturers (e.g. SAP S4/ HANA) and innovative topics and trends to be investigated.

The range is very wide and includes the implementation of new legal requirements or interdepartmental activities such as the government programme "Digital Administration 2020", the investigation of actual use cases and proof of concepts in cooperation with the users, preliminary studies before definite measures are taken and projects down to architectural guidelines for the SASPF target architecture.

Beyond its projects and measures the SASPF program strategy lays the foundations for the digitisation of the Bundeswehr processes.

The Tasks of the New Division G6

The new Division G6, which consists of three branches, centrally assumes the tasks of Master Data Management (G6.1), SASPF Introduction and In-Service Organisation (G6.2) for the AIN major organisational element (Equipment, Information Technology and In-Service Support) and Main Process Management Armaments/Logistics, armaments portion (G6.3) for the entire Bundeswehr.

The Division's responsibilities comprise a large spectrum of user management tasks which span the entire life cycle of the SASPF program and are of essential importance for concept development, implementation and fielding and serve the efficiency of the use/operation of SASPF.

The tasks begin with process planning for the SASPF implementation basis such as defining/updating the process models of armament processes reflected in the ARIS software or the cooperation in producing the phase documents for SASPF projects if they affect the AIN major organisational



SAP S/4 HANA and Fiori architecture



- United States
- NATO Support and Procurement Agency (NSPA)

element or business process elements of the armaments main process.

In the implementation phase, Division G6 is involved in the respective IPT and participates in the generation of specifications. Also, G6 is closely integrated in the project from test preparation and actual testing up to the declarations of acceptance. The fielding organisation is also responsible for the coordination of preparatory measures for production ranging from change management via (initial) training to migration topics such as integrating master data for the SASPF rollout in the AIN major organisational element.

In the field of in-service use and operation, Branch G6.2 deals with user management (assignment of roles/rights within BAAINBw) while Branch G6.1 manages the continuous updates of master data such as the central coordination of master data management by competence teams in the specialist departments and the varied tasks resulting from the CCoE concept.¬ Based on the ITIL standards - the current industry standard for the operation and use of complex IT systems - this concept defines the organisation and management of SASPF and also aims at the continuous improvement of efficiency in practical operation. Some examples of this are the tasks in the field of demand and incident management where Branch G6.3 supports its process components as second level support e.g. with fault analyses, advice and by issuing practical instructions for SASPF users in the entire Bundeswehr.

In summary, the tasks of Division $G6\neg$ can be described as a wide range of individual tasks in the field of "information management" in the context of process-oriented organisation development and modern integrated IT ¬support.

Development of a Defence & Security Solution Based on S/4HANA

The Defence Interest Group (DEIG) is a community of a total of nineteen nations and one NATO agency which use SAP solutions in their armed forces and/or organisations. These are Australia, Austria, Canada, Switzerland, Germany, Denmark, Finland, Israel, the Netherlands, Norway, New Zealand, Poland, Portugal, Singapore, Slovakia, Slovenia, Sweden, Turkey, USA, and the NSPA.

The Bundeswehr is both a founding member of DEIG and a strategic partner for SAP and has by far the largest integrated SAP system landscape of all the DEIG members due to the SASPF project. The Bundeswehr also led the development of the industry solution "Defence Forces & Public Security (DFPS)" from the customer's point of view in the context of the Strategic Development Project (SDP). Time does not stop for SAP either and therefore, a new business suite based on the SAP HANA in-memory database technology – named SAP S/4HANA – has been released.

It is characterised by the simplification of processes, a better performance and a new type of user interface (User Experience) and consists of the following components:

- 1. quicker access to data thanks to the SAP HANA in-memory technology,
- optimisation of processes by providing a newly developed Business Suite (SAP S/4HANA) and
- 3. a more user-friendly interface after the assignment of roles in SAP Fiori.

As additional programme-specific requirements result from military use, the current focus of DEIG is on the development of the S/4HANA Defence & Security solution. The key to military use, the structural element, is central to this but also the use of SAP in disconnected operations, that is to say in scenarios where it is not continuously connected to the central system.

The "New Force Element Concept" (new structural element concept) is currently being developed under the leadership of the organisation main process manager in a focus area. The development and/or further development of SAP systems in disconnected operations via stand-alone decentralised or mobile systems and the offline use of SAP in case of a system failure or maintenance is actively shaped under Canada's leadership with the participation of BAAINBW G1.5 in a further focus area.

IT support for ammunition management including the description of properties (such as the explosive weight) is currently not included in the SAP standard version. Therefore the Bundeswehr uses a self-developed customer-specific solution which is based on a warehouse management application (SAP WM), among others. As almost all DEIG members demand this type of IT support for ammunition management in the SAP standard version, a generally applicable future-proof solution based on Extended Warehouse Management (SAP EWM) is being developed under the leadership of the logistics main process manager in a third focus area.

Integrated Generation of Digital Operational Pictures for an Improved Control and Reaction Capability of the FMOD Executive Group

The increasing dynamics in the fields of foreign and security policy and international Alliance commitments require an improvement of the Bundeswehr control and reaction capabilities.

The FMOD Executive Group's aim "The Bundeswehr provides a sufficient amount of operationally ready forces in order to fulfill current missions" is the guideline for the process "Providing operationally ready forces". Target monitoring serves to control target achievement and is conducted via the operational readiness situation.

The operational readiness situation supports the analysis and control of the operational readiness of the Bundeswehr in order to optimise the supply of operation-



ally ready forces and assets across the entire range of Bundeswehr tasks and missions. It is addressed to the FMOD Executive Group, the directors-general at the FMOD and the Chiefs of Service, the major organisational elements as well as the Commander of the Bundeswehr Joint Forces Operations Command. In order to evaluate the operational readiness situation, a holistic view of all relevant information regarding the operational readiness of personnel and materiel is indispensable. The provision of these situation pictures and any other required digital situation pictures (e.g. logistic situation, training situation, command support situation) and the actual evaluation of the operational readiness situation by military commanders will be conducted from within the SASPF application "IT support operational readiness situation" (IT-U EBL), which is still to be developed.

The aim of the IT-U EBL project is to provide a digital application for the evaluation of the operational readiness situation which



Architecture SAP Business Analytics Platform

serves as control tool and central management cockpit (dashboard) for the user.

In order to implement IT-U EBL for digitising strategic control tasks, a highly integrated solution is required in order to extract all information described above from the data structure of the SASPF system (also from the ERP system), process it adequately and display it (also on mobile terminals).

The SAP Business Analytics Platform used for this purpose provides a common analytic database for all IT projects in the Bundeswehr SASPF environment and therefore facilitates the generation of different situation pictures and views at different points in time (single point of truth). The platform collects links and harmonises relevant data and can also be used for (predictive) planning scenarios and simulations. It thus creates the technological foundation for the further digitisation of the Bundeswehr.

With the implementation of digital situation pictures a significant improvement of the FMOD Executive Group's control and reaction capabilities is facilitated.

Conclusion

The G Directorate is innovative and actively promotes digitisation in the Bundeswehr in cooperation with partners.

The HERKULES Special Organization

With the HERKULES main contract concluded in 2006, the Bundeswehr (Bw) tasked BWI Informationstechnik GmbH (BWI IT) to modernise and standardise the Bundeswehr's non-military information and communications technology as well as to operate many IT components itself – thus establishing Europe's largest public private partnership until then, and breaking new ground.

On the directorate level at BAAINBw, the HERKULES Special Organization (SO H) continues to be responsible, inter alia, for the control of the HERKULES follow-on project (HFP) and the interface to other Bundeswehr IT projects, even after expiry of the main contract.

Since 28 December 2016, BWI is continued as a government-owned enterprise. The HERKULES follow-on project performance contract was concluded as a civil contract law basis for the provision of services. This performance contract also involved changes in the tasks to be performed by SO H, which in turn resulted in changes to the SO H organisational structure. The organisational structure is described in the following.

HERKULES Special Organization Structures

The core task of SO H is the customer management to ensure the continuation of the IT operation by BWI as well as the development of new IT services. The cooperation between the individual organizational elements as well as the interaction with BWI and the new CyberInfoDS major organisational element (Cyber and Information Domain Service) is essential for task performance.

The HERKULES Special Organization is divided into three divisions. Division H1 is entrusted with technical management, financial management and contract management tasks as well as with IT system coordination activities within the framework of the reorientation of the Bundeswehr.

Division H2 is responsible for the IT platform equipment (hardware and software) of the Bundeswehr agencies. In addition, H2 is the technical point of contact for IT projects outside the HERKULES follow-on project, for IT project support and for the centralized SINA Bundeswehr in-service support management.

Division H3 was established in 2013 to ensure that IT operation will continue after the expiry of the HERKULES main contract without any interruptions and to the same extent. The focus was on the preparation of the performance contract and the conclusion of so-called subcontractor contracts by the temporarily established HFP contracting authority. Since the signing of the HERKULES performance contract, H3 (work organization: H-AuP) has been performing the integrated requirements and portfolio management (AuP) as a new core element of customer management.

Requirements and Portfolio Management

The approved BWI 2020 corporate strategy contains requirements for an amended HFP customer management (CM (amended)) that must be fulfilled by SO H in terms of



structures. In addition, modified/new roles and processes must be created and implemented so as to make the HFP services more dynamic. This includes, in particular, the establishment of an integrated requirements and portfolio management. The terms "requirements management" and "portfolio management" are derived from the Information Technology Infrastructure Library (ITIL), which constitutes the best practice for the description of an IT service management. The objective of a requirements and portfolio management is to provide IT services in the required time, scope and quality. The H-AuP requirements management will centrally register, document, harmonize and prioritize all incoming requirements regarding the BWI service portfolio. This also includes controlling of the progress of work. The H-AuP portfolio management is currently being established. In the future, the H AuP portfolio management will match the requirements with the BWI service portfolio, and evaluate the dependencies with regard to other requirements. If necessary, already existing services will be modified, new ones will be developed and outdated ones decommissioned. This is made possible by close cooperation with the Bundeswehr Capability Management.

The objective is to allow for comprehensive and consistent planning so that BWI is enabled to efficiently implement all relevant Bundeswehr requirements regarding the provision of IT services. 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 anticipated in the planning.

Technical Management in the HERKULES Special Organization

Technical management tasks are performed by several SO H branches. Branch H1.1 monitors site-specific HFP measures and the provision of services by BWI in Bundeswehr facilities. Four regional management teams are employed on site in Bw facilities throughout Germany. They coordinate the planning and implementation of all site-specific measures to adapt the Bundeswehr IT system. Branch H1.7 is responsible for the planning, commissioning and performance monitoring of all measures within the framework of the SA-IT project (Structure related Adjustments to IT). This requires close cooperation and coordination between H1.1 and H1.7. Branch H1.1 acts as a central point of contact for agencies and major organizational elements with regard to all site-specific matters. H1.2 performs basic project coordination



Representation of the AuP process

tasks. Within the framework of comprehensive guality management to ensure compliance with contractually agreed standards, BWI's provision of services is monitored and evaluated by means of reports. A subsection of the branch deals with risk management and develops corresponding measures. Thanks to the branch's responsibility for the change management established within HERKULES, findings and lessons learned from risk and quality management can be directly incorporated into service modifications. In addition, H1.2 is responsible for the BWI user help desk and the information and telephone exchange service. The IT security officer and data protection commissioner of the HERKULES project also belongs to H1.2. In Branch H1.3, the responsibilities for the service elements Wide Area Network Bundeswehr (WANBw), telephony and mobile working are pooled. The WANBw element comprises the planning and coordination of all measures relating to network expansion and operation including facility connections. Within the telephony element, the services in connection with the Bundeswehr Next Generation Network (NGNBw) are monitored and further developed. The introduction of NGNBw involved the changeover from voice transmission to Voice over IP (VoIP) and to cloud telephone systems. The term "mobile working" comprises the previous service elements of mobile telephony, remote access service (RAS) and teleworking.

Branch H1.4 coordinates the Bundeswehr's central services. This includes, inter alia, the Bw internet/Bw intranet, the Lotus Notes communications network (KVLNBw), the decentralized servers for systems in use as well as the file service. In addition to controlling these IT services, H1.4 ensures and monitors the project management and conduct of all measures to maintain operational viability for specific CPM projects and inservice support measures. This applies, for instance, to the technical further development of the Bundeswehr's online media, i.e. the redesign of the Bundeswehr internet/ intranet, or the IT support for time and attendance recording.

The core task of Branch H2.1 is the technical control of desktop management services (DMS), client server services (CSS) and LAN active services of the IT platform. These can, in turn, be divided into individual services, such as managed workstation, print and scan services or LAN. These services constitute the IT platform that serves as a basis for the staff members' daily work on the PC. As a new task, the "Performance" team is established within Branch H2.1, which is, among other things, responsible for developing basic principles for an improved service level management.

Branch H2.2 supports all branches of Division H2 with regard to fulfilling common tasks. The main focus of the support services is on the technical component of project preparation and execution. For example, this branch is responsible for research and technology (R&T) studies, market surveys as well as test and reference installations. Currently, H2.2 is preparing the "Groupware Bw" project which will take IT support for promoting cooperation among Bundeswehr members to the next level. The preparation and evaluation of statements of work and concepts also belong to this branch's scope of services. In addition, essential IT framework contracts in the fields of commercially available standard IT are developed and managed here. H2.2 also operates a universally usable test and reference environment as well as



H2.2 test installation in Dresden: staff members check selected IT equipment for compliance with technical data specified in a bid.

the Bw SINA test management system. Branch H2.3 is responsible for managing all Division H2 projects outside HERKULES, which add up to a total of 35 projects in all phases of the CPM (analysis, implementation, use, R&T). The spectrum of these projects ranges from the procurement of COTS IT components to the conceptual design and procurement of IT solutions optimized for military purposes.

Contract Management

In addition to the technical management, SO H has further organizational elements that are responsible for common tasks. Branch H1.6 is one of them.

The core task of H1.6 is the contractual implementation of the projects assigned to SO H. It is thus the central point of contact for all legal and contract-relevant matters regarding the HFP performance contract, the BWI services framework contract and the SA-IT framework contracts (Structure-related Adjustments to IT).

In addition, H1.6 is responsible for the contractual implementation of requirements outside HERKULES, such as research and technology studies, IT maintenance and technical logistic support, equipment suitable for the disabled and IT framework contracts.

Financial Management

H1.5 is, inter alia, responsible for the budgetary planning foundations of the HERKULES follow-on project in the financial requirements analysis. H1.5 contributes to the budget preparation, and monitors the budget execution, for all SO H projects. In order to control BWI's provision of services, the following instruments are employed among other things: capital investment planning, liquidity planning, monitoring of budgets and financial supervision of the contract management.

In addition, H1.5 further develops an accounting system for BWI that is tailored to the requirements of an authority.

H1.5 is involved in the personnel management of the civilian and military BWI personnel.

H1.7 / KOINBw

Since 2012, the Bundeswehr has been undergoing a continuous modification process. Obviously, these structural changes also have an impact on IT. When considering how IT depends on infrastructure, numerous issues arise, including the connection of designated rooms to existing networks, construction works or alternative options (containers) which may be required or have to be provided.

Together, Branches H1.1 and H1.7 (lead responsibility) form the Coordination Organization (KOINBw) for the planning and implementation of structure-related adjustments to the Bundeswehr IT system (SA-IT). Measures taken in facilities are planned and controlled on site by the regional management teams of Branch H1.1 and BWI on the basis of the central planning by Branch H1.7, with the objective being that no performance limitations occur.

Central measures comprise mere relocations within existing organizations as well as the merging of existing equipment or the temporary provision of additional IT in order to meet current requirements. Moreover, adjustments to the file system and Lotus Notes must be implemented.



In accordance with the directives, KOINBw activities will continue at least until 2021. The necessary resources are available.

Projects Supervised in Addition to the HERKULES Follow-on Project

Apart from the HFP, several other projects are managed by SO H. All of those projects share at least operational interdependencies with HERKULES. In the following, two examples are given for projects which are technically supervised by Division H2.

IT Platform: The Flexible IT Framework Contract

It is of increasing importance for the Bundeswehr to be equipped with advanced computer technology, although the individual requirements can vary considerably. Some Bundeswehr projects require small, light and energy-efficient devices while other projects use powerful high-capacity technology. In order to be able to meet these different requirements in a rapid and cost-effective manner, the framework contract for "IT platform - 2nd/3rd PC level" was drawn up and put out for tender under the technical responsibility of H2 at BAA-INBw. The subject of the framework contract is the provision of COTS workstation computers, monitors, servers, peripheral equipment, accessories as well as common additional services.

The determination of requirements started in 2016 and formed the basis for a Europewide invitation to tender. In June 2017, Bechtle AG was awarded the contract with a term of four years.

The framework contract allows for a flexible satisfaction of requirements with many different IT products as well as support services from a single source, without having to purchase minimum quantities.

Remote Support of Maintenance Teams

Another example of the tasks performed by Division H2 is the maintenance forces remote support project.

Evaluations from all operations confirm that the maintenance personnel employed is, in principle, thoroughly trained for specific systems, but still needs support in certain situations due to a lack of experience or particular damage patterns. This is exactly where the maintenance forces remote support project comes into play by obtaining, recording and providing suitable audiovisual data quickly and accurately without delay and in the required quality.

It will thus be possible to "virtually" transfer fault diagnoses to the home base where experts can support the evaluation in a qualified manner. During the audiovisual interaction between the operator in Germany and the maintenance team (up to three soldiers) in the theatre of operations, a headset for audio communication, video/image recording equipment and an augmented reality device are used to provide a clear situation picture.

The Way Ahead

As government-owned company, BWI will not only continue to be the central IT service provider for the Bundeswehr, but will also be turned into the Bundeswehr IT system house and eventually become the federal IT service centre so that it can provide its spectrum of services to other federal ministries as well.

The Bundeswehr IT must be constantly further developed and adapted to the state of the art. Correspondingly, the BWI service portfolio is developed one step at a time. This is accomplished, inter alia, by transferring tasks and projects to BWI which are, at the moment, still managed by the official services in order to enable the Bundeswehr personnel in future to focus more on its core tasks. In addition, the pooling of Bundeswehr IT system services is expected to result in higher productivity and more efficient control.

Complex Services/Purchasing Directorate (E)

The Purchasing Directorate is responsible for the procurement of commercial or specialised materiel necessary for the armed forces. The directorate buys 2 million different supplies, 500,000 of them regularly.

Complex Services (KDL) and the Bundeswehr Purchasing Process (EinkaufBw)

Owing to the moderate realignment of the Federal Office of Bundeswehr Equipment, Information Technology and InService Support (BAAINBw), its capacity to evaluate and control the project and product portfolio assigned to it has been significantly strengthened. This also affects Complex Services (KDL) and the Bundeswehr Purchasing Process (EinkaufBw). The Complex Services/Purchasing Directo-



rate (E) is based in Lahnstein and Koblenz and currently organised into three divisions and 13 branches as well as the Directorate Staff (EAS) and Directorate Controlling/ Bundeswehr Purchasing Controlling (EAC). The Former Division E4, "Utilization, Interdepartmental and Equipment Support, Assistant Defense Materiel Disposal Officer at BAAINBw, Equipment Support and Coordination of Assistance to Other Nations", was detached from the Complex Services/ Purchasing Directorate on 1 July 2017 and reassigned to the newly created Directorate T, "Common Technical, Logistic and Economic Activities".

Tasks

The Bundeswehr's materiel and procurement needs are satisfied via the procurement and in-service support management, which consists of the following three pillars: 1. Procurement of materiel solutions (products) and services i.a.w. the amended Customer Product Management (CPM nov.) procedure;

2. Bundeswehr Purchasing (EinkaufBw) for non-project procurement; and

3. Satisfaction of demand via Complex Services (KDL) and public private partnerships (PPP).

The procurement and in-service support management is characterised by clearly assigned responsibilities, clear-cut decisionmaking powers and a reduced number of interfaces. Within this context, the Complex Services/Purchasing Directorate is responsible for the two pillars of "Satisfaction of Demand Complex Services/PPP" and "Bundeswehr Purchasing"

Bundeswehr Purchasing (EinkaufBw) – Divisions E1 and E2

Bundeswehr Purchasing is defined as the procurement of commercially available and/ or Bundeswehr-specific material goods as well as rights and services which serve to maintain the operability of the Bundeswehr during missions, exercises and routine duty at home and abroad. 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 and requirements which are met via interdepartmental procurement (e.g. "Kaufhaus des Bundes", the Federal government's virtual marketplace). 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 Bundeswehrspecific materiel for equipment and complex weapon systems (follow-on procurement of spare parts for weapon systems).

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

The core principles of Bundeswehr Purchasing are as follows:

- A strategic method of work including a centralised and overarching command and control process;
- Stringent material segment management oriented towards the procurement market; and
- A process-oriented organisational structure.

By implementing Bundeswehr Purchasing, a strategic tier of procurement has been added to the current, mostly operationallevel 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 Federal Ministry of Defence. It is at that level that the organisational framework for Bundeswehr Purchasing is set, purchasing strategies are adopted and policies are established. The responsibility for further developing the process and enforcing it at agency level lies with the Director of the Complex Services/Purchasing Directorate at BAAINBw. The purchasing manager ensures that the guidelines are put into operation by the related agencies.

The Bundeswehr Purchasing system is structured according to "material segments", which are categorised according to the eCl@ss classification system. Based on a holistic approach, the material segments constitute clusters of supply items which are procured on the same or similar markets. The organisational structure mirrors these divisions.

The implementation of the strategic purchasing process was carried out systematically in three phases. The first phase saw the integration of three material segments, namely vehicle technology, office supplies and medical technology, into Bundeswehr



Bundeswehr procurement options

Purchasing. Some early positive results were achieved owing to optimised requirements planning which was co-ordinated with the users. For instance, instead of frequently inviting tenders in order to satisfy recurring small-scale demands, BAAINBw now concluded multiple-delivery agreements with a term of up to three years.

In the field of office supplies, considerable cost savings were achieved by centralising and reducing the number of agreements for paper procurement. Rationalisation was also stepped up by merging seven decentralised procurement agreements for office supplies into one framework agreement encompassing more than 750 supply items, effective January 2017. Switching to the use of recycled paper also made a substantial contribution to 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, two new framework agreements on printer and copy paper were concluded. With regard to 80 gsm office paper, under these agreements exclusive use is made of recycled paper carrying the German "Blue Angel" eco-label.

The second phase of the Bundeswehr Purchasing optimisation process was successfully concluded, with the exception of the material segment "general services." 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 (petroleum, oil and 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 Bundeswehr Purchasing, data on creditors and the framework contracts that had so far been managed in a decentralised manner was now centralised and transferred to a creditor master data management system. In addition, uniform information on the framework contracts of the entire Bundeswehr is now available to all procurement agents in a common framework contract database. However, collecting, maintaining and displaying all data related to interdepartmental framework agreements down to item level with the help of the SASPF software (short for Standard Application Software Product Family) remains the short-term objective.

In the context of the 2016/2017 purchase planning process, the following material segments were finally merged into the strategic purchasing process:

- Auxiliary supplies, additives, cleaning agents;
- Machine parts, fasteners, fittings;
- Laboratory material, laboratory technology;
- Machinery, appliances;
- Operational equipment, workshop equipment (related to the organisational area of Equipment, Information Technology and In-Service Support (AIN));
- Operational equipment, workshop equipment (related to the organisational area of Infrastructure, Environmental Protection and Services (IUD));
- Packaging material;
- Occupational safety, accident protection;
- Piping technology;
- Construction technology;
- Organic chemicals; and

• Semi-finished products, materials. Preparation is currently ongoing to ensure that the complex "general services" material segment will be implemented as fast as possible in the organisational areas AIN, IUD and Personnel.

The target of Bundeswehr Purchasing is to satisfy demand in a time, quality and per-

formance-oriented manner while taking full advantage of cost-efficiency potentials and subscribing to a holistic understanding of service quality.

The framework conditions for Bundeswehr Purchasing have changed due to continuously increasing responsibilities placed on the Bundeswehr and overarching changes to both its IT and its personnel structure. This is why on 17 December 2015 Dr. Suder, State Secretary at the FMoD, issued the order to carry out an open-ended assessment and evaluation of alternative forms of organisation of Bundeswehr Purchasing and to publish a key issue paper detailing recommendations for action on the future shape of Bundeswehr Purchasing.

In February 2017, the State Secretary tasked a follow-on project called "Alternative Approaches to Bundeswehr Purchasing (AAEBw), Phase 2", which was based on the tabled recommendations for action. The aim of the project is to draw up a proposal for a decision on the future shape of the organisational structure of Bundeswehr Purchasing, and on how to enable and enhance it in its present form.

Within the project AAEBw, Phase 2, possible alternative forms of organising Bundeswehr Purchasing are being examined. Additionally, measures are being drawn up which aim at further optimising the current purchasing process.

Besides, Division E1 also carries out the following additional tasks:

- Creating and providing purchasing policy documents (e.g. order catalogues) and purchasing statistics and reports for BAAINBw;
- Acting as the design office for BAA-INBw; and
- Acting as BAAINBw's point of contact for all bids.

Division E4 is organised into four branches. It carries out both strategic and operational tasks at material segment-level and is divided according to the different segments of the eCl@ss structure.

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 in terms of purchasing process analysis is provided for all specific material segments by BAAINBw Branch E1.1. This facilitates a common procurement process throughout the Bundeswehr and for the individual segments. This, in turn, leads to pooling and synergy effects.

Strategic activities for material segments which have already been transferred are now bundled in Branch E2.1, where they are subdivided into weapon system-specific and policy activities. Therefore, the strategic "tools" needed for the development of the operational procurement activities in the majority of material segments have been concentrated in one organisational unit.

In turn, strategic activities for material segments which are not weapon system-specific and do not touch policy are pooled in Branch E2.4. This includes medicine/ medical technology and closely related material segments, for instance laboratory equipment and technology. Both branches have the authority to conclude strategic contracts.

Besides carrying out the strategic activities mentioned above, E2.4 is also responsible for strategic contracting (standard and interdepartmental indefinite-quantity contracts) in the POL material segment, ensuring POL supply at home and abroad.

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

- Implementing the procurement strategies and standards in case any have been set;
- 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/equipment 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 operational procurement are supposed to be developed further by continually optimising the Bundeswehr Purchasing Process. This can be achieved, for instance, by further increasing the number of framework agreements that are initiated via material segment planning. The purpose of this is to use the available resources ever more effectively and efficiently.

Complex Services – Division E3

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

It is a form of satisfying requirements which can occur in all Bundeswehr areas of acitivity and processes whenever a demand cannot, or is not supposed to be, met by using Bundeswehr-owned resources. Unlike with procurement in accordance with the amended CPM, this procedure focuses not on the product, but on the service fitself.

The structure of the division is 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, E3.1 supports the other branches within the remit of Division E3 in all common and policy tasks related to project management, the implementation and documentation of cost efficiency analyses, the creation of statements of work, and during expression-of-interest procedures. Branches E3.2 through E3.4 take on project management responsibilities for complex services of which Directorate E is in charge. These include:

- Bundeswehr Vehicle Fleet Service System (System BwFPS): meeting the Bundeswehr's mobility requirements involving 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 developed and/or moved forward and implemented in these branches. 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, E3.6 is in charge of processing and awarding contracts related to transportation in the Bundeswehr (for transport by road, rail, air and sea). As such, 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 (eg. EUTM Mali, ATAL-ANTA resupply etc.).

1. Bundeswehr Vehicle Fleet Service System (System BwFPS)

The Bundeswehr Vehicle Fleet Service System serves to meet the mobility requirements of the Bundeswehr in an economically viable manner by providing commercial, unprotected vehicles. 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. cessfully concluded. The audit is carried out within the KEK framework with the help of an external accounting firm. The core aim is to make the services of BwFPS GmbH, which operates off-market, comparable with contenders on the civilian mobility market wherever possible.

Additionally, a contract for a planned "competition inquiry" (Untersuchung Wettbewerb) was signed with an external accounting firm in January 2017. This inquiry is intended to examine whether standard commercial mobility services that BwFPS GmbH provides for



Service portfolio of BwFPS GmbH

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

Additionally, E3.6 is in charge of managing the project "PPP Bundeswehr air traffic control training in Kaufbeuren" in terms of procurement and contract law. This contract provides for the training of Bundeswehr air traffic controllers and aeronautical information managers (Flugberater), including related services such as board and lodging.

After the contractor had assumed responsibility for providing the training as of 1 January 2017, the groundbreaking ceremony for the new training campus in Kaufbeuren was held on 19 June 2017. Finally, E3.6 is responsible for processing and awarding various framework agreements for a wide array of support services within the FMoD's remit. The framework agreement on support services for project management, which was signed on 24 March 2017, serves as an example.

As a result, both the project management and the legal and economic expertise related to complex services are concentrated in one division, thereby making it easier to tap into potentials for optimisation.

The following list of outcomes drawn from current projects serves to illustrate the broad spectrum of activities:

The contract on mobility and vehicle fleet management services for the Bundeswehr and measures intended to enhance the Bundeswehr Vehicle Fleet Service System entered into force on 1 July 2016. It merges the previous three framework contracts, i.e.

• the contract on the provision of commercial vehicles,

• the contract on the provision of vehicles with special military equipment and driver training vehicles, and

• the contract on the build-up and operation of a central vehicle management into a single framework contract.

Another innovation of the BwFPS followon solution is that it is unlimited in time. This provides predictability in planning and makes it possible to implement optimisation measures over an extended time period. In order to maintain a constant incentive to innovate even in the context of an open-ended contract, a new instrument named "Continuous Outcome Monitoring" (Kontinuierliche Ergebniskontrolle - KEK) was created. It serves to evaluate whether BwFPS GmbH provided services in a cost-efficient manner and tailored to the demand to highlight existing potentials for optimisation. In May 2017, a contract on the development and implementation of an economic efficiency audit concerning the service portfolio of BwFuhrparkService GmbH was sucthe Bundeswehr can be procured more cost-effectively in certain places. The Bundeswehr Vehicle Fleet Service System is faced with additional challenges which transcend the economic level, for instance creating the necessary preconditions for what is called "instances of demand" (Bedarfsfall BwFPS). Such instances arise when, based on the situation in a mission country, military forces take on control, maintenance, material management, spares management and data management of vehicles which are provided by BwFPS GmbH.

2. Army Maintenance Logistics (HIL)

HIL GmbH was founded in 2005 as a cooperative company to provide services for military land systems. In 2013, the Federal Ministry of Defence became the company's sole holder. Since then, it has been run as an in-house company of the Federal Government.

The service model is working effectively and has become indispensable in terms of ensuring materiel readiness within the Bundeswehr.

After the Bundestag Budget Committee approved the contract for the follow-on solution in June 2017, HIL GmbH has been providing its services on the basis of an open-ended services contract since



A HIL maintenance facility

1 January 2018. Within the framework of the follow-on solution, HIL GmbH continues to guarantee a 70% availability of land systems in principle. Meanwhile, in the coming years, the scope of services is going to be gradually extended beyond the land systems which are already managed by HIL GmbH – i.e. armoured wheeled and tracked Army vehicles in

3.Central Bundeswehr Spare Parts Logistics (ZEBEL):

The project "Central Bundeswehr Spare Parts Logistics (ZEBEL) 6" will end on 31 August 2018. BAAINBw Directorate E signed the contract for the ZEBEL 7 project on 25 August 2017. Working in a timely and needs-oriented manner, it a central warehouse of the contractor; transportation of the parts to the maintenance facilities; and handling of all management tasks in co-operation with the Bundeswehr Logistics Command (LogKdoBw), the Bundeswehr Logistics Center (LogZBw) and BAAINBw.

Material and data management services for Bundeswehr-owned stores that are not self-sufficient will constitute additional elements of the ZEBEL 7 project. This consolidates and standardises the contractual basis of spare parts logistics. The contract will run until 2024 and have a volume of about €146M.

"The ZEBEL 7 project will ensure that the maintenance facilities continue to be supplied with spare parts at all times. This, in turn, will create vital preconditions to make sure that vehicles, weapons and equipment will be available to our forces," said Armin Schmidt-Franke, BAA-INBw's Deputy Director-General, at the meeting in Koblenz where the contract with the company ESG Elektroniksystem-und Logistik-GmbH was signed.

4. Bundeswehr Clothing Management (BMBw)

In order to cater for the special needs of women in the Bundeswehr, and of pregnant soldiers in particular, the Bundeswehr plans to introduce a uniform for pregnant soldiers. 500 kits were procured to carry out a wear test. The number was based on the estimate that among the approximately 22,000 female soldiers in the Bun-



HIL GmbH's scope of services

particular – to include basically all protected and unprotected military land systems managed by the Bundeswehr itself. This will increase the number of land systems managed by HIL GmbH to around 16,000. HIL GmbH also plays a pivotal role in ensuring that the armed forces can train and exercise regularly during routine duty in Germany. Additionally, HIL's management responsibilities will also be extended to include exercises and deployments abroad. thereby provided the conditions for continuing the project, including improved IT connectivity and an extended service portfolio for the users.

The ZEBEL 7 contract focuses on the provision of spare parts tailored to individual maintenance requests from the contractor's warehouse as well as on connectivity between contractor IT systems and the Bundeswehr IT System. The scope of services includes the following elements: the provision of spare parts from deswehr, around 1,200 to 1,300 per year are pregnant. Accordingly, the wear test for "special clothing for pregnant soldiers" has been ongoing in the Bundeswehr since the end of May 2017. It includes field clothing, general purpose and dress clothing as well as underwear. Participants fill out a questionnaire to evaluate general fit and comfort of the clothes. The wear test itself ran until the end of 2017. Results are expected for early 2018 once evaluation has been completed.

Central Affairs Directorate (ZA)

Within the Federal Office of Bundeswehr Equipment, Information Technology and In-Service Support (BAAINBw), the Central Affairs Directorate (ZA) is responsible for central administrative tasks. Four divisions with a total of 18 branches and one directorate office deal with interdisciplinary and general administrative matters.

Division ZA1

Division ZA1 consists of the branches ZA1.1, ZA1.2, ZA1.3 and ZA1.4. As part of Division ZA1, Branch ZA1.1 is responsible for the organisational structures and procedures of BAAINBw and its subordinate agencies, supervision and general administrative matters in BAA-INBw. Branch ZA1.2 deals with organisational studies, manpower requirement calculation, process orientation, regulations architecture, cost and performance accounting and the BAAINBw continuous improvement process (CIP). Organisational studies are systematic investigations of organisations or organisational elements with the aim of developing, after analysis, an optimisation concept for the respective



task. Manpower requirement calculation/ assessment is performed to determine which resources are required to fulfil the specified tasks in a given period of time. Cost and performance accounting is a complement to the cameralistic Federal accountancy system. The Bundeswehr continuous improvement process (CIP) is the possibility of putting forward ideas for improvement. The ZA1.2 CIP officer coordinates all activities to implement and promote CIP within BAAINBw, on behalf of the executive group.

Branch ZA1.3 is the area of Division ZA1 responsible for personnel and physical security.

The BAAINBw Technical Information Center ZA1.4 researches, acquires and archives necessary technical information, and makes it centrally available to BAA-INBw and agencies staff. Bundeswehr contractors receive technical information as part of government-furnished items. Bundeswehr units on mission abroad are supplied with regulations using the DvWeb internet portal, similar to supplying contractors with information. Furthermore, this branch is responsible for administrative tasks in the area of technical regulations for the entire Bundeswehr.

Division ZA2

Structure and tasks of Division ZA2 – Finance – are marked by the particular responsibilities of BAAINBw which 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 operational viability of defence materiel since its founding. The division also administers the budgetary funds required for BAAINBw administration. In the course of moderate adjustments, the tasks of financial planning and implementation of the budget are pooled.

Division ZA2 is subdivided into the branches ZA2.1 "Budget Policy and Tax Affairs", ZA2.2 "Financial Requirements Analysis/ Financial Management and Funds Management for Investments", ZA2.3 "Financial Requirements Analysis/Financial Management and Funds Management for Materiel Maintenance", ZA2.4 "Financial Requirements Analysis/Financial Management and Funds Management for Other Operations, Information Technology and Administrative Expenditures" and ZA2.5 "Contract Accounting".

Branch ZA2.1, besides processing general questions on tax and budgetary law, is involved in contract review and contract consulting in accordance with §§58, 59 und 63 of the Federal Budget Code. Beyond that, this branch supervises all ongoing government claims (e.g. recoveries, contract penalties, interest etc.), does the relevant accounting and performs the payment of taxes for BAAINBw and its agencies. Besides the budgetary involvement in all procedures and measures in accordance with §§23, 26 and 44 of the Federal Budget Code, the branch is tasked, since the adjustment, with ordering all payments of BAAINBw.

The main task of ZA2.2 is fund management for R&T, and for development and procurement of defence materiel. Since 1 July 2017, central tasks of financial requirements analysis are also in its responsibility. Besides funds management for development and procurement, ZA2.2 handles budget item management for non-specific investment-related budget chapters/items. Within the branch, there is a DP section dealing with the operation and transition of existing DP procedures to SASPF for the entire ZA2 Division.

Branch ZA2.3's tasks include financial planning and funds management for materiel maintenance in the framework of materiel responsibility for operational viability.

Branch ZA2.4 is responsible for financial planning and funds management of the funds required for maintaining the operability of BAAINBw and its subordinate agencies. Furthermore, the funds for information technology and the Bundeswehr information and communication system, as well as operator solutions are planned and managed in this branch. The tasks of Branch ZA2.5 include, besides contract accounting for BAAINBw contracts, the supervision of delivery dates, final pricing agreements and recovery and interest on overpaid amounts after price review.

Division ZA3

Division ZA3 "Requesting Agency-related Personnel Activities, Functional Supervision of the BAAINBw Agencies, Common Legal Affairs" consists of five branches and is responsible for personnel, both civilian and military. Branch ZA3.1 coordinates matters concerning civilian BAAINBw staff and is, as such, the main point of contact for all Bundeswehr personnel management offices. In particular, its responsibilities include personnel management for BAAINBw as employing agency.

The branch's responsibilities also include support for the Federal Ministry of Defence, the Federal Office of Bundeswehr Personnel Management and the Bundeswehr Service Centers in matters of personnel.

Branch ZA3.2 is responsible for the decentralised personnel management of military personnel. The chief of Branch ZA3.2 also is the officer in charge for matters concerning military personnel and the disciplinary superior of all officers up to level A15 in BAAINBw, and deputy officer in charge of reservist matters within the organisational area of Equipment, Information Technology and In-Service Support (AIN).

Therefore, ZA3.2 is the central link for military BAAINBw staff to all personnel management offices.

Branch ZA3.3's tasks encompass general and common personnel affairs (civilian/ military). This includes, in particular, user administration and management for SASPF, time and attendance recording, absence time management and maintaining local personnel files.

Branch ZA3.4 - "Strategic Planning of Training and Continuous Professional Development for AIN Personnel, Attractiveness Agenda" - is responsible for the coordination of matters pertaining to basic and advanced training of civilian and military BAAINBw staff. The branch's responsibilities also include support for the Federal Office of Bundeswehr Personnel Management and the Bundeswehr Service Centers in matters of personnel recruitment measures. Moreover, in future, the branch will take care of supporting measures aimed at representing BAAINBw externally, as an example of the Bundeswehr's appeal as an employer. The tasks of Branch ZA3.5 include, beside disciplinary matters, general administration and consulting in matters of the Federal Equal Opportunities Act, staff representation and disabled persons law. The branch also deals with matters concerning the compatibility of work and family life, in particular the establishment and overseeing of childcare facilities in Koblenz and Lahnstein.

Beyond this, ZA3.5 is charged with liability and damage investigation and the functional supervision of procurement in BAAINBw agencies. The administrative data protection officer for BAAINBw is also part of the ZA3.5 staff.

Division ZA4

Division ZA4 includes the branches ZA4.1 "IT Service BAAINBw, IT Security Officer for the AIN Organisation, IT Security Officer for BAAINBw", ZA4.2 "Infrastructure Affairs of the AIN Organisation", ZA4.3 "Internal Services, BAA-INBw Activities in Representation of the User" and ZA4.4 "Postal and Messenger Services, Print Shop, Classified Material Registry".

Branch ZA4.1 is responsible for the IT service and for information security within BAAINBw and the AIN organisation. The term "IT service" encompasses all typical activities relating to the provision of services in IT. For instance, the personal IT requirements (hardware and software) of all personnel is managed in this branch and made available, either as the standard, via the Bundeswehr-owned IT-company BWI, or as a special application via ZA4.1 itself. Individual areas of activity are, among others, the provision of mobile IT and dedicated servers for special applications, teleworking places, programming of data bases and the introduction of a modern document management and groupware system into BAAINBW.

The AIN organisation is responsible for the determination and specification of its own infrastructural requirements, similar to the rules applicable to the services. The Federal Ministry of Defence, BMVg A14, has charged BAAINBw ZA4.2 with the implementation of this task. It includes all agencies and institutions dealing with defence technology, i.e. BAAINBw and all its technical centres, defence research institutes and the naval arsenal, as well as the Fraunhofer Institutes partly funded by the Federal Ministry of Defence. The, mainly atypical, infrastructural requirements of the AIN organisation are primarily aimed at satisfying requirements for trials, investigations and R&T.

The scope of responsibility of Branch ZA4.3 includes internal services for BAA-INBw with the areas "Procurement of own requirements" / "Budget" / "Logistics and material provision" / "Motor pool". The area "Activities in Representation of the User" coordinates all matters concerning the sites, facilities and accommodation of the user BAAINBw in Koblenz, Lahnstein and Bonn.

Branch ZA4.4 ensures internal operations with the areas "Postal and Messenger Services", "Print Shop" and "Classified Material Registry".

Directorate T – Common Technical, Logistic and Economic Activities

The essential joint technical, logistical and economic activities of BAAINBw have been pooled in Directorate T.

hus, Directorate T has a wide range of responsibilities:

- Controlling (for example, R&T projects, enhancing and enabling projects),
- Coordination (for example, mission reviews, fast-track initiatives for operations),
- Support (for example, BAAINBw direction, projects, other directorates),
- External representation (for example, other major organisational elements, offices, departments and international organisations),
- Licensing authority (for example, transportation licenses),
- Surveyor activities (for example, accident investigations).

By combining the common specialist tasks within Directorate T, an essential element was established in the sequence of BAAIN- Bw activities. In addition to Directorates ZA (Central Affairs) and ZtQ (Technical Quality Management Center) as well as Stab OS (Operational Management Staff), Directorate T also acts as link between the common activities and the individual projects.

Division T1

At Division T1 the following tasks have been combined: mission-related matters, overall coordination of research and technology (R&T) matters, international cooperation and project-related international departmental agreements as well as matters of the national territorial commander and the territorial situation (civil military cooperation). Materiel assistance, enhancing and enabling



assistance, contract management for Directorates ZA, T, ZtQ, Stab OS, GB (Executive Secretary of BAAINBw) and Stab J (Legal Affairs Staff), foreign armaments and national, international standardisation, modelling and simulation as well as concept development and experimentation add to the range of tasks of Division T1.

Branch T1.1 is responsible for administrative and materiel assistance and concludes both contracts for Directorates ZA, T, Stab OS, GB and Stab J as well as recycling and/or disposal contracts required for the further handling of materiel disposed. This branch is also in charge of coordinating the task of "enhancing and enabling programmes". The objective of the enhancing and enabling assistance is to strengthen partner nations and allies in order to enable them to perform sustainable peacebuilding, crisis prevention, crisis management and post-crisis rehabilitation in their own responsibility.

In addition, the branch acts as BAAINBw's point of contact in support of the foreign liaison offices and officers as well as the Canadian procurement office.

On behalf of all BAAINBw project directorates and the business division, Branch T1.2 assumes lead responsibility for negotiations and conclusion of project-related international departmental agreements - Memorandum of Understanding (MoU) and Foreign Military Sales (FMS). As regards the MoU part, the branch prepares, coordinates and determines the German position during negotiations, outlines and negotiates agreements and makes statements to the international partners.

Apart from various other projects, T1.2 manages the international agreements for the NH90 and UH TIGER helicopters, the BOXER protected combat and transport vehicle, the LEOPARD 2 main battle tank and associated family vehicles, such as the BÜF-FEL armoured recovery vehicle. As regards the FMS part, Branch T1.2 is in charge of the procurement of weapon systems, their components and associated spare parts via US military procurement authorities. Also, commissioning of US services (training of pilots and other training courses, in particular) is part of the range of tasks of T1.2 – FMS. Within BAAINBw's sphere of responsibility and across all directorates, Branch T1.3 coordinates and manages international co-

operation in the field of common defence technological cooperation not linked to specific projects.

By means of the "Datenbank Internationale Zusammenarbeit" (DBIZA) ("International cooperation database") data collection system, data and panel outputs are provided to German speakers and BAAINBw delegates at international panels.

This branch is BAAINBw's central point of contact in general matters of OCCAR (Organisation Conjointe de Coopération en Matière d'Armement) and EDA (European Defence Agency) as well as Bundeswehrwide liaison activities. It assumes technical supervision of the German Liaison Office for Defense Materiel USA/Canada. In addition, it is responsible for general issues in "defence standardisation" and besides managing technical specifications (TL), it is also in charge of managing and coordinating Bundeswehr standardization activities with the German Institute for Standardization (DIN) in cooperation with the technical expertise between BAAINBw, the agencies and industry. In accordance with the Standardisation Concept of the Federal Government, the branch supports EDA's European standardisation projects. As BAAINBw's standardisation office, the branch is the central point of contact in matters of standardisation within the Equipment, Information Technology and In-Service Use major organisational element.

One main task of Branch T1.4 is coordinating and managing the procurement of missionessential and urgent demand. Such demand may be submitted to Bundeswehr Joint Forces Operations Command (BwJFOCOM) via a request for closing a capability gap during operations. The demand will then be implemented by the project directorates via the "fast-track initiative for operations" in accordance with the (amended) CPM or one of the specified alternative courses of action after the planning evaluation performed by the Bundeswehr Planning Office in close cooperation with BAAINBw.

Another key aspect is on the management of the tasks within the framework of reviewing the lessons learnt with regard to defence materiel in Bundeswehr missions (Bundeswehr mission reviews). The objective of the Bundeswehr mission reviews is to optimise mission performance during operations. T1.4 provides lessons learnt from operations and increasingly from standby commitments, standing operational tasks and exercises also from the military major organisational elements - to the project directorates and technical branches of BAAINBw. Ultimately, this procedure serves the purpose of immediately incorporating the lessons learnt in the further development of materiel and/



International cooperation database

or in the provision of services and, hence, in enhancing the armed forces' mission capabilities. Moreover, another major task is coordinating instructions and orders relating to missions and exercises and within the civilmilitary cooperation framework. The branch evaluates cases with regard to the in-house need for action and elements concerned, involves these elements and, in co-reviews, consolidates feedback received. In this way, technologies for threats and capabilities of the Bundeswehr as well as

 To provide scientific and technological knowledge in all relevant technologies for making appropriate, smart and economical decisions with regard to equipment particularly considering the Federal Government's strategic paper for strengthening the German defence industry and the national defence indus-



T1.4 ensures an efficient handling of these cases.

Branch T1.5 coordinates all activities of BAAINBw and its subordinate agencies in the field of defence materiel research and technology (R&T) both on national and international levels.

In addition, the branch establishes the foundations of data and information within the framework of strategic R&T control performed by the Federal Ministry of Defence. The common objectives of all R&T activities are as follows:

 To ensure an analysis and evaluation capability of the department for a timely recognition of the significance of new try key technologies as specified in that paper.

Another essential task of Branch T1.5 is to evaluate foreign defence materiel. These evaluations provide valuable fundamentals for the analysis of capability gaps and for the technical adaptation of Bundeswehr in-service systems in line with prevailing threats. Research and technology is carried out in this field as well.

At present, Branch T1.6 is responsible for Modelling and Simulation (M&S) as well as Concept Development and Experimentation (CD&E) at BAAINBw. As regards M&S, specifications of the Bundeswehr Concept and other subordinate documents in accordance with the four fields of application

- Training and exercise,
- Analysis and planning,
- Mission support and
- Satisfaction of demand in accordance with the (amended) CPM
- are implemented.

This includes activities in the field of standardization and provision of simulation data as well as the further development of tools and services for integration into existing simulation networks and solutions for establishing new complex heterogeneous simulation networks and a simulation-based analysis. Moreover, the branch coordinates, with the CD&E directing centre, the assistance of BAAINBw in CD&E projects under the responsibility of the Bundeswehr Planning Office. The objective of being involved in the CD&E process is to acquire knowledge for specific project development and support of experiments using resources of the project directorates and the subordinate agencies. At present, the establishing of a geospatial

At present, the establishing of a geospatial information element to support the future



Safety and Health Act, apply to the jobs of servicemen and women as well as civilian personnel both during routine duty when conducting performance demonstrations and trials and, on principle, during operations. Also, the provisions of the Product Safety Act are to be observed as a matter of principle. Bundeswehr civilian personnel and servicemen and women, in particu-



Occupational safety and health and environmental protection aspects for a protected transport vehicle

task of "Bundeswehr Simulation Data Coordination Cell" is being prepared. This coordination cell will be responsible for, among others, the preparation of Bundeswehr-wide specifications and standardisations for simulation data and for the coordination of the administration of simulation data that have been generated and stored in compliance with standards.

Division T2

In the implementation and in-service use of defence materiel, the system-related protection tasks based on legal and non-legal specifications are to be observed.

Thus, the German occupational safety and health regulations, such as the Occupational

lar, are entitled to health protection in the workplace and humane working conditions in the same way as employees working in trade and industry.

Furthermore, Bundeswehr activities, for example, during training and exercises, operations and in the repair of weapon systems, must have no inadmissible impacts on the environment.

Apart from these traditional responsibilities, the focus is also increasingly on functional safety and/or software security when assessing system safety due to the strong dominance of smart system components in Bundeswehr weapon systems.

In this respect, the project managers of the individual weapon systems are responsible for observing those requirements.

Experts of the "Product-related Protection Activities" Division T2 support and advise the project managers within the framework of system support in the "occupational safety and health, environmental protection and human factors engineering" project elements and when observing the requirements of weapon system safety and design safety of ammunition.

Likewise, the Chief of Division T2 also acts as BAAINBW Safety Engineer. The Chief of Branch T2.2 acts as "Officer for Design Safety of Ammunition and Firing Safety at BAAINBW".

Ultimately, T2 Division coordinates and supports the Bundeswehr health management for BAAINBw personnel in Koblenz/Lahnstein.

Branch T2.5 ensures disposal of Bundeswehr materiel. In an interconnected approach, Branch T2.5 manages and monitors the disposal activities in order to relieve the Bundeswehr from excess materiel in terms of logistics. In the process, special attention is paid to observing the provisions of the War Weapons Control Act and weapons laws, the Closed Substance Cycle and Waste Act and the environmental laws. Suitable materiel is sold to third parties via the federal-owned VEBEG GmbH. Apart from sales, large amounts of materiel are also handed over to other countries (materiel support of allied nations), which has political significance and contributes to a positive Bundeswehr image.

With its functional demonstrators, the Scientific Collection of Defence Engineering Specimens (Branch T2.6) as archive of the office and defence documentation library contributes to preserving know-how in the "Equipment, Information Technology and In-Service Use" element and, thus, supports the career training of civil servants as well as pre-deployment training of forces by lending out foreign weapons. When visiting the public exhibition in Koblenz-Lützel, citizens who are interested in defence engineering may reconstruct essential lines of military technology development from the late 19th century until today by means of 2,500 exhibits.

Division T3

Division T3 is divided into the following branches:

- Cost Competence Center (T3.1),
- Price Auditing Policy/Common Price Auditing, International Program Offices (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 Cost Competence Center is tasked with supporting the economic execution and implementation of projects and organizational measures in all phases of the (amended) CPM by means of

- Parametric cost estimates,
- Cost-effectiveness evaluations,
- Assessments of alternative forms of procurement and
- Review and staffing of phase documents.

In particular cases, additional cost-effectiveness evaluations are conducted outside of the (amended) CPM. Furthermore, T3.1 is BAAINBw's central point of contact for matters regarding life cycle cost management. The tasks of Branch T3.2 range from

- Central contract control of price audits,
- 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 organizations and NATO program 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, if cost prices are appropriate. For this evaluation, they use detailed cost data and documents and assess the quantities and valuations.

The task is based on the provisions of national price law and the specifications of the departmental agreement of the Ministry of Defence with the Ministry of Economy. By means of the auditing results from the pre-

Responsibilities of Division T4 Common Activities Relating to Expenditures for Equipment, In-Service Use and Logistics Concept tasks Equipment/In-Service Use/Logistics procedures Process officer for logistics in the Armaments/Logistics main process for the AIN major organizational element **Basic tasks** Equipment/In-Service Use/Logistics terminology work Automatic Identification Technology (AIT) Materiel information and fundament Configuration and change management Obsolescence management Technical reliability Individual tasks in the Logistics project element (i.a. materiel management, Integrated Logistic Support - ILS / Logistic Support Analysis - LSA) Support tasks Import and export matters, end use Bw IMP office Codification Preparation of logistic master data Providing projects with expertise in terms of the Logistics project element Disposal officer Bw Logistics System POC at BAAINBw AIN operational logistics Technical supervision of contract management, materiel management and maintenance of the agencies Furnishing of BAAINBw and its agencies AIN operation and supply responsibility Certification office for loans in the AIN major organizational element and provisions to the agencies Transportation matters

calculatory period-related standard cost auditing, in particular, the project directorates of BAAINBw are able to make long-term agreements at prices based on valid hour rates and surcharges.

Division T4

In Division T4 "Common Activities Relating to Expenditures for Equipment, In-Service Use and Logistics" primarily logistic responsibilities have been combined.

Its tasks focus on project support in managing the logistics project element in all lifecycle phases of defence materiel. The division is the link to the Bundeswehr Logistics Command and is, as such, essential service provider in implementing product-related logistic processes. Furthermore, in cooperation with the Logistics Command Division T4 has a key function in the tailoring and further development of the Bundeswehr Logistics System.

Branch T4.1 assumes basic Equipment, In-Service Use and Logistics tasks and, within the framework of technical support tasks, advises the projects with regard to the logistics project element.

Branch T4.2 provides the project directorates with technical support in all issues regarding materiel management (for example, management and prediction of inventory additions) as well as disposal of defence materiel. In addition, the branch's appointed materiel disposal officer makes conclusive decisions about all disposals.

Branch T4.3 maintains the materiel planning objects catalogue across organisational boundaries for the Bundeswehr and, hence, provides the basis for materiel planning throughout all agencies. Furthermore, the branch advises and supports the project directorates of BAAINBw with regard to codification of materiel (on individual request), is responsible for user administration in the "Complete Equipment Schedule Annex Sheet" data processing procedure, assigns project identifiers and defines technical responsibility for supply items.

BAAINBW

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Branch T4.4 provides operational support to agencies subordinate to BAAINBw (Bundeswehr technical centres and research institutes) and assumes technical supervision of these agencies with regard to their logistic tasks in contract management, materiel management, maintenance and equipment planning.

Branch T4.5 is responsible for the management of imports based on procurement contracts of BAAINBw and its subordinate units, the Federal Office of Bundeswehr Infrastructure, Environmental Protection and Services, the Bundeswehr universities and the Bundeswehr Geoinformation Office. It is also responsible for exports/shipments for disposal and Bundeswehr materiel transfers to other countries including requests to the Federal Office for Economic Affairs and Export Control, customs clearance and export control at BAAINBw. In addition, the branch manages transport activities, transport fundamental issues as well as Bundeswehr materiel loans, free-of-charge releases and the end use of defence materiel as well as maintenance activities for equipment loaned by HIL GmbH and is responsible for the aforementioned aspects.

Directorate T is a component of efficient armaments management by supporting the project directorates in all technical, economical and logistical matters across the entire range of projects and products. Moreover, Directorate T is strongly involved in strategic issues of the Armaments Agenda, strategic R&T control and the In-Service Use Agenda.

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 organisational structure as a 'center' of its own 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 structure 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 100% inspections of parts carried out by public authorities.



The independent division ZtQ complements division ZA and T in technical terms, especially when it comes to outside contractors.

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 technical quality management, especially within the framework of the operational conduct of Government quality assurance measures, Division ZtQ1 has power of direction within the remit of the Federal Ministry of Defense. 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 government quality assurance inspections made by international allies who have concluded defence contracts with German companies. The Bundeswehr quality assurance authori-



Picture left: Pre-contract analysis of requirements and project-related risks is the basis for successful contract implementation; Picture right: Quality assurance inspectors being trained on a foreign kamikaze drone (non-Bundeswehr)

ties are also renowned internationally for their high professional competence, which is recognised abroad to provide a competitive advantage. Big corporations or major public sector projects that are insufficiently monitored by authorities but still operate in accordance with the imperatives of maximum profits or efficiency are being more



and more overtly criticized 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 investing 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.

Three Regional Districts

In order to make sure that the Technical Quality Management Center's regional offices (formerly 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' site. 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 Defence (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.

Legal Affairs Staff (J)

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.

he Legal Affairs Staff basically evolved from the former BAAINBw Division Z3 and is now subdivided into the Branches J1 (procurement law), J2 (contract law policy) and J3 (intellectual property rights). A substantial workshare of all Branches within Staff J is the quality assurance in projects with an estimated contract value of over €25M (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 Staff 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 of tasks which connects all Branches with one another, each Branch has its independent basic task.

Branch J1

Branch J1 is responsible for all general matters regarding procurement law. The tasks of Branch J1 also include advice on procurement law for the project divisions and the BAAINBw executive group as well as processing of the BAAINBw Procurement Procedure Work Instruction and the respective forms, such as the decision on the award procedure.

Other important aspects in Branch J1's work are reverification procedures and reprimands concerning BAAINBw. In this context, the co-review of contract award-related reprimands thanks to which procedural errors can be rectified or the contested decision made by BAAINBw can be explained to the person reprimanding BAAINBw is of particular importance. 2017 was no exception in terms of the considerable amount of reprimands and co-reviews processed. It is becoming increasingly obvious, however, that intense analysis of the subject matter of reprimands and appropriate communi-



cation with bidders are worth the effort. In addition, Branch J1 has the concurrent supervision under procurement law over the business activity of enterprises with government participation 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 M. In order to be able to provide draft contracts to the contract branches that are dependable and accepted by industry, consultations with industrial associations take place on a regular basis.

In the context of contract quality assurance in major projects, Branch J2, apart from continuously accompanying these contracts, also manages the IT (especially the SAP Contract Lifecycle Management (CLM) programme) that is used to support contract management tasks with regard to legal aspects and is responsible for permanently checking and updating the clause library contained therein. These responsibilities also include the continuous updating of the contract management handbook. Branches J1 and J3 support J2 in their respective areas of expertise. The contract management handbook is a process-related guideline for BAAINBw legal experts regarding the lifecycle of contracts with a value of over €25M. Furthermore, responsibilities concerning quality assurance also include in-house trainings.

Further activities of Branch J2 relate to the management of 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, J3 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, industrial property rights and/or technical know-how.

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

Apart from that, this Branch provides technical advice for drawing up and checking technical specifications. In this process, the focus is placed on requirements management so that it conforms to the awarding and contracting regulations and a precisely defined terminology.

The BAAINBw Agencies

A total of six defence technology departments, two military science departments and the Naval Arsenal are subordinate to the Federal Office of Bundeswehr Equipment, Information Technology and In-Service Support (BAAINBw).

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

WTD 41 in Trier and its branch offices have broad competences as regards wheeled and tracked vehicles, propulsion systems and chassis components, electric-chemical energy sources and stores, vehicle electrics, engineer vehicles, POL and field camp technology, soil mechanics, hydraulics and compressed gas technology. Thanks to its technically highly gualified personnel and its unique infrastructure WTD 41 has what it takes to execute and evaluate trials and examinations of ground vehicles and their components. Tasks are mainly assigned by the Federal Office of Bundeswehr Equipment, Information Technology and In-Service Support (BAAINBw) as well as by further customers from Germany and abroad. At the moment WTD 41 has approximately 460 employees. Moreover, WTD 41 offers vocational training in the occupations "Kfz-Mechatronikerin/Mechatroniker" (automotive mechatronics engineer) and "Elektronikerin/Elektroniker für Geräte und Systeme" (electrician for equipment and systems).

WTD 41 is divided into an economic/administrative and a technical/operational service element as well as into three divisions: "200 Component Technology", "300 Vehicle Technology" and "400 Engineer and General Field Equipment". In order to fulfil its tasks WTD 41 is main-

ly responsible for the following areas:

- Trials/examinations and assessment of land-based vehicle systems
- Trials/examinations of vehicle components
- Trials/examinations of engineer and general field equipment

WTD 41 also bears the sole technical responsibility (including trials/examinations) for batteries, charging technology and fuel cells of all services.

The specific competence and associated responsibility for automotive electrics, automotive electrical system simulation,



for the diagnosis of automotive bus systems, for electrical tests conducted on assemblies and components for tests on electric generators and for vibrationrelated environmental tests can also be found here.

Moreover, WTD 41 conducts research and technology studies with regard to vehicle-specific applications, carries out projects in all phases of the CPM (amended) in individual cases and supports the official project management of BAAINBw with technical expertise.

In order to maintain and establish the required technical expertise, WTD 41 cooperates, among others, with universities, national and international defence technology institutions and participates in international bodies.

WTD 41 fulfils the tasks resulting from its area of responsibility by using its seven premises in Trier, Koblenz-Metternich, Koblenz-Rübenach 1 and 2, Baumholder, Föhren and Fraulautern. In order to perform these tasks, WTD 41 has numerous test tracks and terrain courses of various soil composition and degrees of difficulty. Used for the conduct of mobility trials, they permit a broad spectrum of different investigations with the aim of yielding the highest possible amount of reproducible data. Apart from mobility trials and tests on roads, special test tracks and off-road tracks, investigations by means of test stands and simulation facilities make up an essential part of WTD 41's work and help gather reproducible data regarding the performance and reliability of the respective systems and components under test.

The results demonstrate to the Customer whether the contractually agreed functional requirements have been met, whether vehicles/equipment are suitable for their intended purpose or where weak points may have to be expected during later use, and whether the legal requirements necessary for approval, e.g. regarding security aspects, are fulfilled. Thus, the activities conducted by WTD 41 do not only refer to the development, but also to the in-service support phase of vehicles to incorporate lessons learned on operations into the process of both improving existing and developing new vehicles and components.

Currently, WTD 41 is testing a large number of wheeled and tracked vehicles as well as individual assemblies and components. This year, for example, driving, certification and environmental tests (e.g. cold, heat, rain, icing, salt, fog) as well as tests on road and rail transportability were conducted for the adaptation kit of the IRIS-T SL guided missile system within the context of the Tactical Air Defence System (TLVS) project. Moreover, the certification test, including subsequent certification of the bridge-launching vehicle of the LE-GUAN assault bridge, was conducted and the first operator briefing (military/civilian) with regard to the associated bridging vehicle was completed. As regards the PUMA and MARDER Infantry Fighting Vehicles, adaptation kit integration analyses of the light multirole guided missile system (MELLS) were conducted in order to test, among others, the functionality of the overall system under vibration load during vehicle operation. The verification trials in accordance with CPM (amended) for the FUCHS KAI armoured carrier, which include for example driving tests, functional tests of the overall system as well as the examination and testing of the hydraulic system, were also conducted this year.

Permanent tasks with operational relevance are tests of POL supply and engineer equipment prior to delivery to the theatres of operations and the weighing of air transport containers (with contents). Furthermore, WTD 41 has been actively involved in the presentation of the Bundeswehr at fairs and exhibitions within the framework of recruiting campaigns as well as in supporting the technical service career training and supervising student interns.

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, concealment 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



View on the valley area of WTD 52 with the land mine and IED detection facility under construction in the foreground



Interior view of the land mine and IED detection facility with the detection tracks

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 test
- 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 southeastern 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, there is a Bundeswehr 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 compliance demonstration.

The focus during the tests regarding the protection of the soldiers on operations was on testing fibre concrete as a means of protection against weapon effects and detonations. Apart from the actual threats and the desired protection level, other factors must also be considered for creating protective elements on operations, such as simple construction-related framework conditions. Reinforced concrete slabs containing fibres are a promising solution for the protection against contact detonations. The analysis of the impact of debris on the protection side is especially interesting. The tests at WTD 52 were conducted in cooperation with the Federal Office of Bundeswehr Infrastructure, Environmental Protection and Services and the Bundeswehr University, Munich.

The load on the individual concrete slabs was effected by means of contact detonation, i.e. with a high-explosive charge directly on the surface, and the dispersion of debris was recorded with high-speed cameras. Afterwards, the tests were compared to those done with reference reinforced concrete slabs. The formation of debris on the protective side was considerably higher in the case of the reference slabs without fibres compared to the fibre-reinforced slabs.

The use of steel fibres led to considerably less debris formation during the tests; this significantly minimises the risk of injury for persons in the protection area.

Asymmetric threat scenarios have gained more importance in recent years. In this context, attacks are often carried out with booby traps and IEDs in order to inflict high losses on persons or materiel. In order to be able to better detect and/or localise such IEDs in the future, the land mine and IED detection facility, a unique test site, was created at the Bundeswehr Technical Center for Protective and Special Technologies. Dual sensor systems are mainly used for IED detection at the moment. These dual sensor systems consist of a metal detector and a soil penetration radar. The metal detectors are used to detect metal objects in the soil while the soil penetration radars are supposed to pick up changes in dielectricity.

Certain sensor technologies react sensitively to disturbances caused by metals. This is why no metals were used in the construction of the detection facility. In addition, physical influencing parameters of the soils relating to the detector properties and their performance can be assessed under nearlaboratory conditions with the integrated sprinkler system (e.g. by varying the soil moisture).

The floor area of the facility spans over a length of 70 m and a width of 25 m, which allows for two detection tracks with five different kinds of soil. The detection tracks have a depth of 1.5 m and a width of 5 m. An exhaust evacuation system for vehicle-borne detection systems is also available.

The facility has been designed as a means to analyse the performance of detection systems (handheld and vehicle-borne in particular) for the detection of IEDs in different kinds of soils, such as loess loam, basalt, humus, sand, and gravel. The different soils place variable demands on the detection systems due to the particularities of the soil physics. The soildependent detection limits in terms of performance and operation can thus be determined under optimal conditions. A detector that works well on one particular kind of soil may show considerable performance shortfalls in the case of other soil compositions. These deficits shall be determined and analysed in order to implement improvement and optimisation measures afterwards. This is the only way to ensure that the user is provided with a detection system with which he can fulfil the required task in the best possible fashion.

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 as well as aeronautical evaluation and in-flight substantiation resulting from flight tests. It is the Bundeswehr's technical center of excellence for military aviation.

cies contributes decisively to the preparation of selection decisions in procurement projects, and, by extension, to cost efficiency. This is why specialist and technical expertise is continuously maintained and enhanced. The performance spectrum of WTD 61 comprises two major areas. WTD 61 experts of the first area (technical expertise) provide the sole 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. Core tasks include specifically military tasks such as air-to-air refuelling or air drop systems, as they cannot be covered by external support, as well as testing new sensor and communications technology and integrating new weapons and self-protection systems. Among many other fields of expertise, night vision capability, electromagnetic compatibility and signatures constitute special tasks. The technical center helps to build these up as core tasks within the Bundeswehr, in collaboration with other agencies and offices. WTD 61 experts of the second major area

(flight tests and special measuring methods) have the sole official competence to independently evaluate and qualify aeronautical equipment. This is especially true in those fields where no industrial capabilities exist or in which they are being cut back on a national level. Providing





TORNADO night vision capability trial

The agency supports 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 the field of aviation, WTD 61 together with the other BAAINBw agenin-service support for all (manned and unmanned) systems is a core task of the technical center and a prerequisite for gaining official insights and maintaining flight test know-how. To maintain its capacity to evaluate and give advice independently, the center has its own test aircraft pilots for all types of aircraft that undergo testing. Moreover, there are weapon system officers as well as flight mechanics and loadmasters at WTD 61 who are specially trained for flight testing of certain types of aircraft. The overall responsibility for planning, controlling, coordinating and evaluating flight tests carried out at the technical center lies with flight test engineers trained at flight test schools. It is crucial to establish ever closer links with the forces. WTD 61 is also strengthening its cooperation with research institutes in order to make technologies ready for operational use faster. The agency is thus actively involved in the phases of analysis and in-service support as well as in the area of research & technology.

In conclusion, the special tasks of WTD 61 encompass development support as well as in-flight substantiation and technical compliance demonstration in all national and international flight test projects in which Germany has a stake. Other special tasks include the qualification and technical evaluation of developments and the assessment and testing of all airborne Bundeswehr weapon systems complete with subsystems and equipment as well as their outfit/armament. WTD 61 supports BAAINBw in all aircraft projects. It also assists the Bundeswehr Aviation Office with technical expertise in airworthiness verification and type certification activities. Specialist tasks related to aeronautical navigation, avionics, mission systems and propulsion systems are dealt with by WTD 61 on its own responsibility. To fulfil its tasks, WTD 61 runs an airport, equipped with all required technical facilities, its own test bed vehicles (including related measurement technology) and a wide spectrum of test facilities (drop zone, engine test stands, telemetry, cinetheodolite stations for tracking, firing range etc.). Due to European and international developments, WTD 61 has initiated all organisational measures required to adapt its maintenance, repair and operation of aircraft, i.e. the entire organization of flight operations, to European provisions that apply to military aviation (DEMAR/EMAR (German/European Military Airworthiness Regulations), in particular DEMAR 145, DEMAR M and DEMAR 66). WTD 61 will apply these regulations for the first time during the in-service use of the A400M aircraft and later to all airborne weapons systems. The Bundeswehr technical center aspires to become certified as DEMAR 21 facility so as to ensure that flight testing can be conducted using its own developments and installations. The training is already certified in accordance with EASA Part 147. Current tasks of WTD 61 include test-



Light Utility Helicopter Special Operations Forces

ing all in-service Bundeswehr aircraft (with respect to night vision capability, laser protection, air-to-air refuelling, dropping of cargo, persons or recovery equipment), conducting test and compliance demonstration activities during compatibility tests aiming at approval of a wide range of national and international ground handling and test equipment as well as adapting state-of-the-art medical equipment to German passenger transport systems, testing drones and integrating weapons.

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

As a facility of the Federal Government tasked with departmental research, Bundeswehr Technical Center for Ships and Naval Weapons, Maritime Technology and Research (WTD 71) is the central technicalscientific authority of the Federal Government within the naval armaments sector. WTD 71 is responsible for tasks in all areas of maritime defence technology and defence research. Thus, it provides the technical expertise in maritime research and development required to provide suitable and safe maritime equipment to the Bundeswehr. The objective of all WTD 71 activities is to

provide reliable and operational systems and equipment to the German Navy.

With its integrated capability network of technical expertise, maritime scientific competence, knowledge of methods as well as technical and scientific trial/measurement infrastructure, WTD 71 forms the link between the products ("ship" as an overall system, the platform and deployment system portions, systems, individual appliances, equipment), the military capability requirements of the German Navy, the project management of the German Federal Office of Bundeswehr Equipment, Information Technology and In-Service Support (BAAINBw) as well as defence industry and external academic facilities (institutes, universities).

WTD 71 has a long tradition. The Imperial German Navy already tested its torpedoes in the Eckernförde Bay and built a torpedo experimental station there in 1912. Today, 600 staff members at WTD 71 use their know-how to develop, test and procure naval weapon systems. Scientists and engineers, gualified and experienced technicians, tradesmen and mariners have made WTD 71 the centre of professional expertise in maritime defence technology within the entire armaments sector. After several reforms, WTD 71 now comprises a total of nine facilities located all over the federal state of Schleswig-Holstein.

The Agency's Core Tasks

Maritime research

Establishing, extending and maintaining the required assessment and advice capability by conducting research projects in its own responsibility as well as awarding, supporting and evaluating research and technology studies in all fields of naval armament.

Technological investigations

Own experimental and analytical investigations (experiments, demonstrators, studies, market analyses, evaluations, simulations) of maritime defence materiel in all CPM (amd.) phases, also under maritime environmental conditions, in particular, to determine the productibility, suitability and performance capability of appliances and systems.

Tests and demonstrations

Conduct of demonstrations for naval armament systems and equipment in all CPM (amd.) phases (performance demonstrations, integrated compliance demonstrations) as well as operational suitability tests under maritime field conditions.

In-service support

Expert support of in-service naval weapon systems (such as magnetic or acoustic ranging). ment, 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 the special field of activity dealing with shock and vibration resistance.

The main tasks of the "Reconnaissance, Effects, Force Protection" division include the investigation and provision of technologies for further development of and defence against maritime weapons. Engineers working in the field of underwater weapons have to deal with vessel





Torpedo firing platform of WTD 71 in Eckernförde

An additional task is the active cooperation in bilateral or multilateral organisations such as the German-Dutch Center for Ship Signature Management (CSSM) as well as cooperation or representation of Germany at international organisations such as UN, NATO, EDA etc.

The following tasks are distributed to five divisions:

The "Ship as a Weapon System" division 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 functional test. At present, the first frigates of the new F125 generation are undergoing trials.

The "Ship Technology, Combat Survivability" division is in charge of naval engineering tasks related to the developtechnology in hydrodynamics, propulsion technologies, energy accumulators, metrology and control engineering. In addition, underwater sensors including the associated signal processing for minehunting is another focus.

The "Sensor Technology, Signatures, German CSSM Representative" division 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)" located at WTD 71 in Kiel.

The "Underwater Detection and Communication" division 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 test facilities, some of which are unique in Europe:

- Measurement 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 platform and firing range
- 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 tonnes)

The main focus of the current work is on the following projects:

- Class 180 multirole combat ship (MKS 180)
- Class 125 frigate (F 125)
- Class 124 frigate hardware regeneration (F 124 HWR)
- Class 123 frigate capability adaptation (F 123 FAP)
- Class 130 corvettes

• Operational training center / Navy procedural training (EAZ F/EGV and VTAM) In the near future, more new naval projects will be added:

- New generation class 212 submarine (U212 CD Norway/Germany)
- Class 332 minehunter with drone control capability (MJ 332 CL)
- WTD 71 defence fleet (STS and SVK projects)

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

WTD 81 examines and works on a wide spectrum of tasks on all Bundeswehr systems of information technology (information collection, transmission and processing) for several Bundeswehr systems and takes responsibility for three areas of technology.Kalvarienberg, 100 meters above Greding (Bavaria), is home to the WTD 81 and one of the largest absorberlined chambers in Europe for the study of electro-magnetic compatibility (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. size and position of the projections quickly and in manifold ways facilitating thus the evaluation of the tests.

Being competent, innovative and efficient, WTD 81 is an important economic factor in the Bavarian region of Middle Franconia. The potential of its personnel



The new Terrestrial Magnetic Field Simulator

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 hardwarein-the-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 Costumer Product Management (CPM amended). 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 center's LAN. The media wall allows to change and its well-established areas of activity qualify for being a future-oriented hightech center 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

FUCHS-KAI APC Examination of the VHF/UHF Radio Systems

The Bundeswehr requires a mobile system for the detection and disposal of booby traps and mines for future missions abroad. This system must be able to dispose of these hazards quickly and efficiently while providing the best possible protection of the soldiers.

Such a system is being realised within the scope of the TPz FUCHS-KAI project (Fuchs APC – explosive ordnance reconnaissance and identification) and is currently in its final planning stage.

Currently, the integrated compliance demonstration is performed at WTD 81 in cooperation with industry. This stage involves the following technical areas of WTD 81:

- Integrated test systems,
- Radio communication,
- Navigation and target survey,
- Electromagnetic compatibility,
- Electronic warfare.

Two especially critical aspects during the realisation of the overall system were the integration of all required radio antennas on the roof of the FUCHS-KAI APC taking into account the high antenna characteristics and the integration of all command and control assets into a very confined space.

In order to be able to comply with the sophisticated technical system specification, apart from WTD 81, three civil and various military agencies also contributed to the evaluation trial. The objective is to introduce the Fuchs-KAI APC in 2019.

LeFlaSys (Light Air-Defense System)

LeFlaSys (light air defense system) is a highly mobile air-transportable air defense system on the basis of the light armoured WIESEL 2 vehicle and consists of a reconnaissance, command and fire control vehicle (AFF) and an OZELOT weapon carrier. When equipped with STINGER shortrange surface-to-air missiles with an en-



FUCHS KAI APC examining VHF/UHF radio systems on the outdoor measurement site



View of WTD 81



Functional test of the reconnaissance, command and fire control vehicle at WTD 81

gagement range of several kilometers, it is thus perfectly suitable for the protection of smaller ground objects such as, for example, bivouacs.

Having been taken over by the German Air Force in 2011, the decision was made to keep the system in operation until 2025. Due to various obsolete hardware and software components and a change in requirements from the Air Force, it was decided to modify the system.

The objective of this product modification is to:

- Implement an IBMS software (Integrated Battlefield Management System) adapted to the LeFlaSys to replace the HFlaAFüSys (Army Air Defense Surveillance and Command and Control System) and ALLRO (integration of LeFlaSys into airspace control),
- Replace the obsolete operating systems LynxOS, Windows NT and pSOS by one future-proof operating system,
- Integrate all functions to operate the systems on one main computer,

- Eliminate deficiencies in IT security,
- Have the system accredited as operational basis of the anti-air warfare system,
- Have all vehicles converted by the second quarter of 2018.

This product modification thus concerns the CCI and weapons control system FüWES, the communication equipment, radar, IFF (identification friend or foe system), navigation and IPS (integrated inspection and testing system) control and some system functions of the AFF system sensor. Extensive evaluation trials are planned for the compliance demonstration of these specifications

Bundeswehr Technical Center for Weapons and Ammunition (WTD 91)

Tasks and Facilities

WTD 91 is the main Bundeswehr proving facility for weapons and ammunition and has the sole specialist competence in this field in the entire organisational area of Equipment, Information Technology and In-Service Support.

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 centre holds significant competences in the fields of acoustics, optics, optronics, laser technology, battlefield reconnaissance, simulation engineering, geoinformation, special engineer infrastructure, and measurement engineering.

The agency's excellence centre for explosives is the only authority in the organisational area of Equipment, Information

Technology and In-Service Support that is 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
- Effects and protection
- Ergonomics
- Ballistics
- Simulation
- Optics/optronics
- Laser technology
- Battlefield reconnaissance
- Acoustics

In addition, WTD 91 is responsible for the project management i.a.w. 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 explosives used in the Bundeswehr, and material qualification of the components pursuant 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. material properties) or for ejection tests of pyrotechnical decoys of air vehicles.

WTD 91 is responsible for specialist tasks in all phases of the (amended) CPM. 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



127 mm/L64 VULCANO naval gun on the F125

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 a 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 geo-penetrators (effectors with very high penetration rates in soil and concrete, due to their shape and

Federal Office of Bundeswehr Equipment, Information Technology and In-Service Support (BAAINBw) and the other agencies of BAAINBw, but also with military Bundeswehr elements and European partners. In accordance with the concept for the strategic orientation of land agencies, WTD 91 focuses, for instance, on the areas of battlefield reconnaissance, gun-type weapons and guided missiles, laser technology, and geoinformation affairs.

Current Testing Projects

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

The core responsibilities of the agency include 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. The tests of artillery weapon systems and ammunition serve as an example of that, in particular the qualification of the 127mm ammunition of the Navy. In September 2016, the 127mm AFFUSTO firing stand manufactured by Leonardo was put into operation by means of an acceptance firing in Meppen. September 2016 also saw the commencement of the gualification of the 127mm ammunition for the new F125 frigate class ships at WTD 91 with the support of Branch 420. First off, a strength demonstration had to be conducted for the new 127mm PRAC projectile, which was fired from the new firing stand. WTD 91, under the leadership of Branch 420 and in cooperation with WTD 71, successfully completed the acceptance testing of the weapon of the 127mm/L64 LCG naval gun on the F125 frigate (Baden-Württemberg). The system modifications to the armament system were verified by the manufacturer through tests.

Branch 500 of WTD 91 is responsible for the subject areas of simulation, reconnaissance, and sensor systems, including testing and inspection of optical and optronical systems. The XAVER 2016 field trials may serve as an example here. During these tests, the effectiveness of countermeasures against ground-to-air missiles could be demonstrated. The field trials took place on the premises of WTD 91 in September and October 2016 under the leadership of Branch 520. The aim of this campaign, which is conducted regularly in Meppen, is the continuous improvement of the self-protection of airborne Bundeswehr weapon systems against guided missiles equipped with an IR homing head. On behalf of BAAINBw, government agencies (WTD 91, WTD 81, and WTD 52) and industry (IABG and DEWCS) were cooperating with the troops (AFFCOM Flying Operations Directorate and Special Air Mission Wing, FMOD) in the XAVER 2016 trials in order to improve the protection of the flying platforms against heat-guided missiles. In this process, the whole chain of effects – threat and protective measures in the context of the aircraft to be protected - is examined. To this end, the homing heads of the MANPADS Man-Portable Air-Defense System were mounted to platforms. They were thus following the in-air maneuvers of the different aircraft. The aircraft flew over predetermined drop points from different directions and at different altitudes and launched their flares (decoys) there. The reaction of the pertinent homing



High-speed recording of the 127 mm PRAC projectile



NH90 launching flares

heads was measured and assessed on the ground. The field trials deepen and accompany the NATO EMBOW campaigns, of which EMBOW XVI took place at WTD 91 in 2017. The results of the XAVER 2016 field campaign will contribute to the improved protection of airborne Bundeswehr weapon systems during future operations.

The Bundeswehr Research Institute for Protective Technologies and CBRN Protection (WIS)

WIS is tasked with the protection of Bundeswehr service members against the effects of nuclear, biological and chemical weapons of mass destruction. It is also tasked to develop the technical-scientific fundamentals required for this purpose, to contribute to covering the demand for CBRN and fire protection equipment and to ensure the national capability of assessing CBRN weapons.

Considering the fact that Bundeswehr personnel are more and more assigned to deployments outside Germany and experts are sent to crisis countries for advising and training purposes, the aspect of protecting the soldiers against such threats has become more and more pressing. Research and development with regard to subjects such as the quick and safe identification of active ingredients within explosive ordnance disposal activities, checking and evaluating of unknown substances by means of chemical-analytical methods, decontamination, cleaning of potable water and handling of contaminated wastewater are essential for ensuring health and defense capabilities of field units that are deployed to war zones and need to be prepared for the use of unconventional weapons. Also, for instance, the detection of and protection from High-Power Electromagnetics (HPEM), which might jam the functional capability of electronic Bundeswehr systems or damage these systems, are important research tasks of WIS.

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 all subject-specific issues.

- Latest examples for the work of WIS are
- Verification of the ban on chemical weapons

WIS is contributing to the investigation of the incidents in Iraq and Syria and, by means of its highly specialised laboratory, provides essential findings that serve as a basis for political decisions.

Detection of biohazards

Besides taking samples (also for forensic purposes), the range of tasks includes all aspects with regard to equipment from measuring instruments to protected and deployable high-security infrastructure.



Interaction of the WIS departments

Non-contact detection of warfare agents and chemicals

From remote detection to camp protection and to surface measurements by means of spectroscopic methods, WIS develops and tests future technology. In the process, self-sustaining detection systems are taken into consideration just as sensor networks on various carriers.

Protective equipment

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 optimized in close cooperation with industry. After ous types of raw water are tested for retaining contaminants as well as operational safety.

• Electromagnetic effects

Electromagnetic pulses (EMP) generated in nuclear weapon detonations or other high-power electromagnetic (HPEM) fields are capable of jamming and/or destroying all types of unprotected electronic components within a large radius. WIS examines the protection level of military equipment including large-scale systems on the basis of measurements and develops conceptual proposals for improvement.

• Fire protection

WIS activities focus on fire detection and fire suppression by means of automatic fire extinguishing systems incorporated in weapon systems. Besides,



Former State Secretary Dr. Katrin Suder and the former head of the institute, Dr. Georg Maier (right), and the former head of "Material, Designs, Structures", Dr. Wolfgang Kreuzer (left), open the Bundeswehr 3D printing center at WIWeB in 2017. In February 2018, Dr. Kreuzer took over as head of the institute.

the introduction into service, accompanying Government quality assurance ensures the high performance potential of the equipment.

Ecofriendly decontamination

For the decontamination of toxic industry chemicals, biological or chemical warfare agents and radioactive fallout, WIS conducts testing of procedures and equipment, some of which require few chemicals or none at all. In doing so, special emphasis is put on safe detoxification as well as preservation of functions of devices, such as electronic devices.

Water treatment

Mobile procedures for the production of service and potable water from vari-

ecofriendly fire extinguishing agents are investigated and developed for Bundeswehr-specific applications.

 Northern Hazardous Substance Measurement Office

WIS supports safe Bundeswehr activities by investigating and evaluating hazardous substances in work areas or the environment.

• Central collection point At WIS, Bundeswehr radioactive waste is conditioned for later final disposal and put into interim storage.

"Researching – Testing – Advising – For the safety of our soldiers" According to this slogan WIS, with its versatile spectrum of tasks, makes a contribution to future-oriented, functional equipment of the Bundeswehr and, moreover, with its scientific findings, makes an important contribution to CBRN protection.

Bundeswehr Research Institute for Materials, Fuels and Lubricants (WIWeB)

The Wehrwissenschaftliches Institut für Werk- und Betriebsstoffe (WIWeB, Bundeswehr Research Institute for Materials. Fuels and Lubricants) is the Bundeswehr competence centre for technology, security and reliability of materials, fuels and lubricants as well as for clothing and personal equipment of the soldiers. 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 assigned to the Bundesamt für Ausrüstung, Informationstechnik und Nutzung der Bundeswehr (BAAINBw, Federal Office of Bundeswehr Equipment, Information Technology and In-Service Support) in Koblenz. A total of 215 employees work at the institute's two locations in Erding (headquarters) and Wilhelmshaven.

Current Adjustment of the Organisational Structure

In order to better respond to the challenges through new responsibilities as a result of the reorganisation of the Bundeswehr, the organisational structure of the institute was modified in July 2017. The goal was basically to concentrate the technical know-how in three divisions, and this to a larger extent than previously, to be able to process complex tasks quickly and effectively. New technologies, such as additive production methods, were proactively combined with the necessary technical know-how, including the organisational aspect.

Materials, Designs, Structures

The properties of engineering materials such as metals, plastics or ceramics are very relevant for the strength and stiffness of mechanical defence systems. Accordingly, this division has various possibilities of research and analysis at its disposal, ranging from microstructure analysis and non-destructive testing to mechanical testing of test samples or larger components. Numerical analysis methods for the simulation of physical and mechanical properties are available. The directing centre for welding and bonding technology of the Bundeswehr is also a part of this division. In February 2017, the centre for 3D printing was opened at WIWeB. The centre is responsible for researching the technology of additive production methods and, in particular, to promote its application in the Bundeswehr. For this purpose, the Bundeswehr 3D printing centre has extensive equipment available to manufacture plastic and metal components.

Clothing, Surface Technology, Chemical Analytics

The institute supports the entire life cycle of the soldiers' equipment, from development and utilisation to disposal. This includes, for example, the preparation of specifications for clothing and items of the personal equipment of the soldiers. Further tasks of importance are the defining and testing of camouflage methods on textiles, the assessment of wear comfort and issues on body protection.

WIWeB benefits from many years of experience in the field of chemical analytics and surface technology. The Hazardous Substance Measurement Office Süd of the Bundeswehr is only one of the facilities that profit from this experience. The office determines and assesses the exposure of Bundeswehr employees to hazardous substances thus crucially contributing to occupational safety and health at home and in the deployment areas. Surface analytics and technology are important tools to solve manifold issues in almost every WIWeB area of activity. One example is the evaluation of new and/or advanced adhesive bonding techniques.

Fuels and Lubricants, Material Protection

With its technical competence and expertise, WIWeB is responsible for supplying the forces with efficient fuels and lubricants. There is, consequently, a great variety of issues to be dealt with, two examples being to ensure that the Bundeswehr weapon systems can be operated in-theatre with fuels and lubricants that do not meet Central European standards, and that introduced fuels and lubricants are compatible with the materials of the corresponding systems.

The protection of materials from environmental exposure to ensure long life and the desired operational readiness of the components made of this material is of eminent importance. WIWeB has access to unique experience and equipment to test and assess material protection systems to perform this task. An essential goal is to improve the environmental compatibility of the current systems.

Expertise and Networking Equally Required

The capabilities of the institute are aimed at understanding and assessing materials and fuels and lubricants in a system context. The institute is certified in accordance with DIN EN ISO/IEC 17025 for most of the test methods. Apart from specialised knowledge complemented by interdisciplinary thinking, networking and cooperation with all Bundeswehr sectors, the defence industry and international partners from Europe and other parts of the world are indispensable. The status of a departmental research facility is an opportunity to gain and improve required knowledge through research, which represents a particular advantage for technical advancement. A successful evaluation by the German Council of Science and Humanities confirmed this status

German Liaison Office for Defense Materiel, USA/Canada

The German Liaison Office for Defense Materiel, USA/Canada (DtVstRü USA/ CAN) is an agency subordinate to the German Federal Office of Bundeswehr Equipment, Information Technology and In-Service Support (BAAINBw). It is located in nologies and various land-based, airborne and seaborne weapon systems.

The agency's personnel largely consist of engineers and scientists but also lawyers and non-technical administrative officers. In October 2017, the posts in the USA assigned to the task area of "Materiel Responsibility for Operational Viability" were transferred from the military major organisational elements to the "Equipment, Information Technology and In-Service Support (AIN)" organisational element, and thus to the Liaison Office USA/CAN. This resulted in an increase of posts to a total of 51 posts. More than half of these posts are assigned to the following project offices:

- Rolling Airframe Missile Project Office (RAMPO) in Crystal City/VA
- NATO SEASPARROW Project Office (NSPO) in Crystal City/VA
- German PATRIOT Office (GEPO) in Huntsville/AL
- Multifunctional Information Distribution System International Program Office (MIDS IPO) in San Diego/CA
- NATO Improved Link 11 in San Diego/ CA

as well as to the liaison offices located at US Army and US Air Force facilities. The tasks and activities of the German Liaison Office USA/CAN aim at employing available national resources as effectively and efficiently as possible within the frame-



The office building in Reston, Virginia

Reston in the US federal state of Virginia. The German Liaison Office for Defense Materiel USA/CAN represents the Bundeswehr's interests in matters of defence technology and armaments vis-à-vis the armed forces of the United States of America (USA) and Canada and these countries' industry. This transatlantic cooperation covers a wide range of defence-related techwork of bilateral and multilateral cooperation. This serves to strengthen the national military and industrial capabilities as well as to support the development of combined standards and interoperable solutions for the mission-oriented equipment of the armed forces. At this point, reference is made to the MIDS Low Volume Terminal (LVT) that is developed and produced by five nations and is now employed by more than 30 nations.

In this light, the German Liaison Office USA/ CAN is the competent point of contact for initiating and coordinating armaments cooperation with the USA and Canada in research and technology as well as mutual 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 Bundeswehr and the management of personnel exchange programmes with defence engineers, defence scientists and administrative personnel of both nations. Furthermore, the German Liaison Office USA/CAN supports BAAINBw in implementing various projects in the USA. Accordingly, it is presently intended to procure the following:

- Heavy transport helicopter (STH)
- PEGASUS (PErsistent German Airborne SUrveillance System) as High Altitude and Long Endurance (HALE) Unmanned Aerial Vehicle
- C-130 Hercules

In addition, the office assumes quality management and Government quality assurance tasks for products ordered in the USA and conducts these tasks in accordance with the contractually agreed acceptance criteria. In this context, the office also makes use of the cooperation with US and Canadian quality assurance services on a regular basis.

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 an 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 Federal Office of Bundeswehr Equip-



The Naval Arsenal in Wilhelmshaven

ment, Information Technology and In-Service Support (BAAINBw).

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 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 modi-

fications are developed and, in part, also implemented at the Naval Arsenal.

- Performing 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 inservice 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 "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.

The Naval Arsenal and its technical management personnel assume the role of prime contractor for selected maintenance and repair projects for frigates and corvettes. What is known as "selfmaintenance" proves to be successful with ships of these classes. Apart from its economic advantages, self-maintenance also ensures that the know-how remains with the Naval Arsenal. "When you're in a hostile environment, miles from a safe landing area, the last thing you need is a question mark about reliability. I had complete confidence in the EJ200 engines, allowing me to focus on the combat task."

UK RAF Wing Commander in Libya

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