SPECIAL ISSUE

Defence Procurement in Germany

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Content

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

Procuring defence technology is just not as easy as privately shopping online. If you are dealing with defence technology development, you quickly realise that defence products must meet the highest requirements. You are looking for the most modern technology, that is robust enough to survive military operations and that can be used for decades. In part, commercially available equipment can be used; in many cases, however, it is necessary to improve or newly develop special defence materiel.

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

Director-General

| Deputy Director-General | Deputy Director-General (military) |

SekrLtg — **Office of the Director-General**

FAS — **Occupational Safety Officer**

GleiB ziv — **Commissioner for Gender Equality (civilian)**

GleiB mil — **Commissioner for Gender Equality (military)**

P	K	L	S	U	I	G	H	E	Q	Z
Equipment Management and Strategy Directorate	Combat Directorate	Air Directorate	Sea Directorate	Land Support Directorate	Information Technology Directorate	IT Support Directorate	Special Organization HERKULES	Purchasing Directorate*	Quality/Logistics Directorate	Central Affairs Directorate

Local Staff Council at BAAINBw

Regional Staff Council at BAAINBw

General Staff Council at BAAINBw

Local Spokesperson for Disabled Employees BAAINBw

Regional Spokesperson for Disabled Employees BAAINBw

General Spokesperson for Disabled Employees BAAINBw

Foreign Liaison Offices at BAAINBw Public Works and Government Services Canada (PWGSC) at BAAINBw

Defense Engineering Advisory Group

* At the same time Defense Materiel Disposal Officer at BAAINBw
Date: January 2016

BAAINBw office buildings in Koblenz-Rauenthal

And thus, it takes time to procure such complex materiel: Time to come up with the required technical solutions and to test them with demonstrators. Not every new idea from the development departments passes the practical test on the first attempt. Realistic concepts of time are indispensable. The procurement process must be as efficient as possible. Test and quality control measures must be strengthened. These are also objectives of the reorientation of the Bundeswehr.

Responsibility for the Entire Life Cycle

The "Bundesamt für Ausrüstung, Informationstechnik und Nutzung der Bundeswehr (BAAINBw)" (Federal Office of Bundeswehr Equipment, Information Technology and In-Service Support) was founded within the scope of the reorientation of the Bundeswehr. Before the BAAINBw had been founded, the responsibility of the civilian Bundeswehr procurement organisation ended with the handover of the new defence materiel to the user. The new procurement procedure, however, – the revised CPM (Customer Product Management) – focuses on an integrated approach and support of defence materiel during the entire life cycle – the so-called material responsibility for operational readiness. This global view requires a new way of thinking in terms of equipment and procurement processes in order to implement this integrated approach. And this is the approach of BAAINBw.

Material responsibility for operational readiness is a new task for BAAINBw. Never before has the Bundeswehr dealt with such a task using the integrated approach. It is therefore particularly important to bring those together who have previously been in charge of certain aspects. The new office not only combines the tasks of 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). It also integrates those elements of the military offices responsible for in-service management.

At the same time, personnel from the military offices tasked with in-service management had to be transferred to the BAAINBw. Thus, the knowledge from the two previous offices in the area of procurement is effectively supplemented. Only by this transfer of competence and know-how will the BAAINBw be able to competently assume its comprehensive tasks in the area of material responsibility for operational

readiness, starting with the analysis phase and ending with disposal.

Complementary Capabilities of Directorates and Agencies

The technical expertise for defence materiel is pooled in ten directorates and one special organisation. Six project directorates, responsible for Combat (K), Air (L), Sea (S), Land Support (U), Information Technology (I) and Information Technology Support (G) are available for implementation of armaments projects. The in-service support tasks taken over from military offices and commands are integrated into the directorates' projects on a product-by-product basis.

The HERKULES special organization is responsible for customer management within the HERKULES project, the largest IT modernisation project in Europe, with which the Bundeswehr is well prepared with modern equipment for administrative IT tasks, even in areas of operation.

The "Equipment Management and Strategy" (P) Directorate is responsible for project coordination as well as strategic and operations-related tasks for all directorates. Within the scope of the integrated planning process and the analysis phase of the CPM (rev.), this directorate focuses on research and technology topics and is also in charge of plotting the capability state and the conceptual further development of the Bundeswehr IT system. Furthermore, it is a point of contact for external departments, political or media representatives, and the general public.

The Purchasing (E), Quality/Logistics (Q) and Central Affairs (Z) Directorates assume central administrative and cross-sectional technical and economic tasks.

The performance spectrum of the office is supplemented by modern test and research centres. Six Bundeswehr technical centres, two Bundeswehr research institutes and the Bundeswehr Information Technology Center (IT-ZentrumBw) deal with testing of defence materiel, development of new technologies and the analysis of potential improvements of already fielded systems. The Naval Arsenal ensures the operational readiness of the German Navy and is thus a direct and valuable partner of the Navy in operational theatres. The liaison office in Reston/USA represents Germany's defence technology and armaments interests vis-à-vis government organisations and industry in the United States and Canada.

Solid Basis and Constant Adaptation

BAAINBw and its agencies are well prepared for the demanding tasks in order to accomplish the new task of the integrated view and responsibility for defence materiel. For almost three years, BAAINBw has successfully completed its tasks of being responsible for material for operational readiness.

However, there is still potential for optimisation. To achieve this, processes that used to be heterogeneous are thoroughly analysed, checked for their harmonisation potential and implemented accordingly. Also, the procurement process CPM (rev.) as a whole is subject to evaluation.

One thing is for sure: The new approach of transferring responsibility for the entire life cycle to the BAAINBw makes sense. The Bundeswehr can achieve added value by the integrated responsibility in the office and by harmonised in-service management. ■

Directorate P

Consultant to the executive level, in charge of overall project control and strategy, and BAAINBw's interface to the outside world

In a modern procurement process, a multitude of influencing factors have to be taken into account if the requirements for effective and technically up-to-date armed forces are to be met. This is one of the reasons why Directorate P was established: to provide purposeful leadership and control in the early stages of complex armament projects. According to its mission, Directorate P serves as a hub for all projects, providing information internally as well as to the outside world. In addition to its advisory function for the executive level and the Federal Ministry of Defence (FMoD), the Directorate also plays a key role in BAAINBw's project management. It verifies compliance with strategic project specifications and interfaces with the Bundeswehr Planning Office which represents the interests of all stakeholders in the procurement and in-service process.

Directorate P is entrusted with cross-project and inter-directorate tasks. This gives it directive authority over the project directorates, although it does not interfere with their respective technical and specialist authority.

Aside from its management role, the Directorate also handles a number of strategic tasks for the Bundeswehr. They include coordinating the implementation of strategies and concepts for IT system architecture, IT service design, and IT portfolio management, as well as the concept development and experimentation (CD&E) process. Furthermore, Directorate P coordinates research and technology, the provision of modeling and simulation (M&S) tools within BAAINBw's area of responsibility, and non-project-related international armaments cooperation.

Since its reorientation on 1 October 2015, the Directorate also serves as BAAINBW's external interface – it is the point of contact for external departments, political or media representatives, and the general public. To this end, organisational units assigned to the processing of inquiries or audit assignments by external bodies have been integrated into Directorate P.

The Directorate is divided into four divisions and a total of eleven branches.

The core activities of Division P1 "Equipment Management" include coordinating and handling BAAINBw activities under the Integrated Planning Process (IPP) and in the analysis phase of the amended CPM, advising the BAAINBw executive level on general or prioritised project matters, compiling project-related status information, coordinating all operations-related tasks, as well as coordinating research and technology.

Within the Integrated Planning Process, the Bundeswehr Planning Office is in charge of plotting the capability state and identifying capability gaps. If such gaps are to be closed by materiel solutions, Branch P1.1, as main interface to the Bundeswehr Planning Office, contributes the technical and economic know-how of BAAINBw to the processing of initiatives and the production of the Capability Gap and Functional Requirement (FFF) document in the first part of the analysis phase of the procurement process. To this end, P1.1 considers lessons learned in own projects, system contexts, commercially available products, as well as those products and services still being developed, results from defence research, international armaments cooperation, operations, and in-service use. As far as is admissible by contracting law, expertise from the economic and industrial sector is also taken into consideration. Branch P1.1 covers the performance dimensions land, sea, aerospace, and cyberspace, as well as the capability domains reconnaissance, command and control, effectiveness, and support. It also evaluates feasibility with a view to the factors of time, costs, and technology. P1.1 thus supports the Bundeswehr Planning Office from the start of the procurement process in collecting essential data of a planned product over its entire life cycle from development and service use up to its disposal, and in including this data in the decision-making process.

This work provides the basis for a requirements management taking into account system relations throughout a product's complete life cycle. The systematic risk analysis and assessment is a first substantial contribution to the risk management of armaments projects.

(Graphics: BAAINBw)
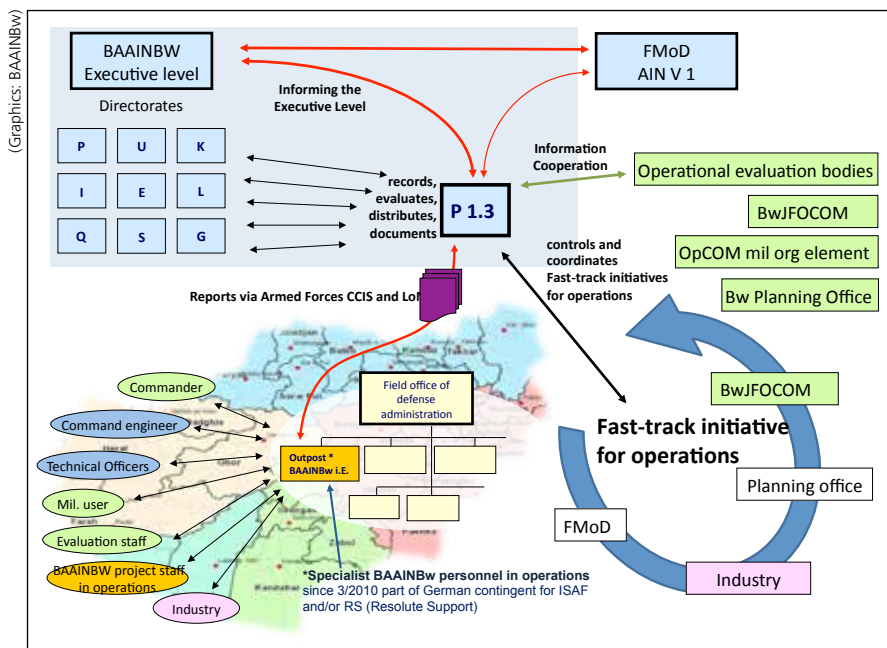
Branch P1.3 – working relations

The number and complexity of projects, as well as new tasks during in-service use, require resources close to the executive level capable of providing information on the current armaments, IT and in-service situation with a focus on programmes relevant to the executive level at any time. Branch P1.2 performs this task by summarising and evaluating important information from the project directorates for the BAAINBw ex-
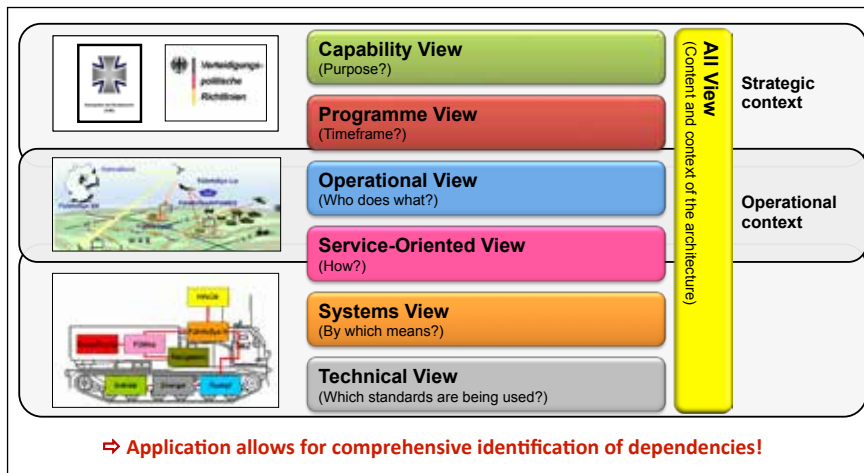
NATO Architecture Framework

⇒ **Application allows for comprehensive identification of dependencies!**

ecutive level. It also uses new findings from operations, which it receives from Branch P1.3. A future-oriented view of projects is crucial. In this context, risk management is an essential tool.

In the framework of the new procurement process, the project council, headed by the BAAINBw Director-General, was introduced. The project council decides on the way forward when problems occur in the projects and, if required, orders project reviews, which are executed by the project managers under Directorate P control. Resources for this control function are kept available at Branch P1.2, whereas other BAAINBw branches contribute other resources, depending on the task to be accomplished.

P1 collects, documents, and evaluates all BAAINBw contributions for the financial requirements analysis. This contribution to financial requirements planning provides the basis for all budget items managed by BAAINBw in a leading capacity. It includes financial requirements for research, development and testing, procurement and maintenance, POL products, IT and communication lines, as well as any existing operator contracts for improvement placed by the Bundeswehr. In this context, the total financial requirements of all ongoing armaments projects are taken into account, starting with the analysis phase and post-design services, and ending with modifications to fielded products.

Branch P1.3 mainly deals with coordinating and controlling the procurement of mission-essential and urgent demands, and the evaluation of lessons learned with defence materiel in Bundeswehr operations abroad. Coordinating the "Fast-track initiative for operations" in accordance with the amended CPM to meet urgent mission requirements is a key task across all project directorates and technical centres of BAAINBw. Starting with the take-over of responsibilities, all activities are coordinated and supervised with regard

to both technical tasks and necessary contractual activities. Monitoring of procedures is crucial as mission requirements are extremely urgent, resulting in tight schedules. The second major task is controlling after-action assessments. As any equipment provided under the "Fast-track initiative for operations" is introduced into the Bundeswehr with a challenging timeline, the need to retroactively evaluate the user experience is particularly strong. For the purpose of after-action assessment, BAAINBw specialist personnel with military status participating in operations has continuously been present in Afghanistan since March 2010, playing a major role in quickly resolving technical issues with defence materiel in the area of operations. The responsibility for selecting and leading this personnel lies with Branch P1.3. Before leaving for a mission, this staff is introduced to current projects by various project teams and technical centres or research institutes, and is prepared for the main technical challenges defence materiel faces in the area of operations. Lessons learned from operations – including those by the major (military) organisational elements themselves – are provided by Branch P1.3 to BAAINBw project work or to the documentation of the armaments/IT and in-service use situation. The information collected is used directly in the improvement of defence materiel, serving to improve operational readiness.

Branch P1.4 supports the Director P in assuming responsibility for the coordination of all R&T activities of BAAINBw and its subordinate agencies. To achieve a focused, efficient and effective execution of defence research and technology activities, P1.4 closely cooperates with the points of contact in the BAAINBw directorates responsible for R&T tasks and the different fields of R&T at BAAINBw and its agencies, without infringing upon their responsibilities in the technical field. In doing so, special consider-

ation is given to new conceptual guidelines, derived from the Bundeswehr Planning Office's capability analysis, the developing links between security and defence research, and the internationalisation of R&T, particularly in Europe. In this context, it is important to develop a common understanding with the Bundeswehr Planning Office on how to provide the right R&T findings in a timely manner for decision-making in the CPM (amended) framework.

Division P2 "Strategy" performs long-term work across different areas, and coordinates the implementation of strategies and concepts for the Bundeswehr IT system, network enabled operations, concept development and experimentation (CD&E), and modelling and simulation (M&S) tools in BAAINBw's area of responsibility. It also coordinates international cooperation across different areas.

IT Strategy

The FMoD IT strategy states that the "architecture method" for the Bundeswehr IT System (IT-SysBw) is to be applied to the identification and satisfaction of demands. While the operational architecture is to be prepared by the armed forces, BAAINBw is charged with establishing the system architecture and the technical architecture for all performance dimensions and capability domains. Branch P2.1 "Bundeswehr IT System, Architectures and Interoperability" is the IT system architect, and as such, responsible for the development of the overall architecture of the Bundeswehr IT System. It harmonises guidelines with the Bundeswehr Planning Office on syntax, semantics and architecture development and modification tools which serve as a basis for the production of specific architectures by the projects to highlight cross-project system interactions with little effort, and to continuously and consistently document the current status. This facilitates the evaluation of new capability requirements of fielded products and products in the process of being fielded, in the context of the overall technical system, and allows the results to be incorporated in the FFF documents via the Bundeswehr Planning Office. The expected result is a better integration of new materiel procurement solutions in the Bundeswehr procurement system. In the long term, this also means a transition from Bundeswehr IT System architectures to operational and functional chains of effects within the "Bundeswehr as a system". A further task of P2.1 is to advise the project managers on methods in all matters related to working with architecture. The branch also handles the representation of

the method and the architecture tool to external parties (such as Bundeswehr Planning Office, major organisational elements, etc.).

The FMoD IT strategy states that all Bundeswehr IT projects are to have a service-oriented architecture. The key control mechanism for this purpose is the IT Service Portfolio for the Bundeswehr IT System managed by the Bundeswehr Service Designer. This function is allocated to Branch P2.2 "Service Design and Strategy" and handles the integration of new IT services into the service design of the Bundeswehr IT System.

the area of responsibility of the FMoD. As Service Portfolio Management has been allocated to Directorate P with no relation to a specific project, it can focus on all performance dimensions to an equal extent. The provision of services using one single platform only is thus prevented; instead, existing IT services can be re-used and co-used as much as possible. Control and coordination of strategic guidelines are handled on the level of the Strategic Objective of BAAINBw Systems and the AIN directorate-general of the FMoD. By disassociating the strategic from the implementation level, the quality-focused implementation
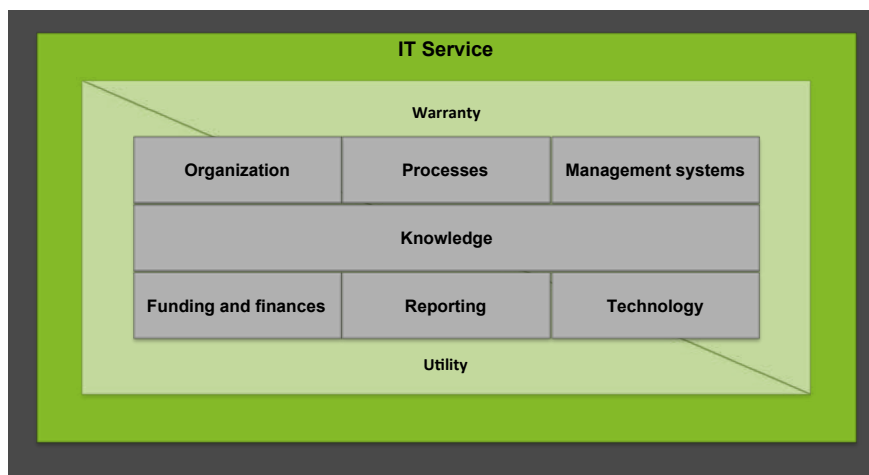
purposes, the parameters of technical and tactical issues can be analyzed in-depth through technical and agent-based simulation, augmented by data farming.

Branch P2.3 also hosts BAAINBw's simulation centre – the central platform for M&S application and use. Aside from an advisory function with regard to the improvement of the simulation infrastructure for network-based simulation experiments, its work also includes the harmonisation of standards with international partners.

P2.3 also includes the CD&E Centeer coordinating BAAINBw's contributions to CD&E projects managed by the Bundeswehr Planning Office. At present, the Branch supports the following national CD&E projects: "Situation in the Information Environment", "Bundeswehr-wide Setup of Network Enabled Operations", "Initial Operations", and "Air Surface Integration". On a multinational basis, it also contributes to the "Multinational Capability Development Campaign", a series of projects led by the USA. Consequently, the work of P2.3 focuses on mission orientation and on issues relating to network enabled operations. By participating in the CD&E process, P2.3. intends to gain insights for actual project development and to support experiment-based projects with resources provided by project directorates, Bundeswehr technical centres and research institutes, and the Bundeswehr IT Center. The receiving office for conceptual ideas by industry is also part of P2.3. This office ensures that conceptual ideas from industry are dealt with in a legally permissible manner, in particular with regard to compliance with contracting law and copyright.

IT service tablet

To this end, the Bundeswehr Service Designer analyses and contributes to policy and CPM documents in order to identify new IT services and adapt existing IT services accordingly. The common IT platform pools the common IT services defined and updated by the Service Designer. His/her work generates mandatory standards of use for existing common IT services and standards for the design of new services. If sufficient resources are available, P2.2 also offers consulting services to bodies of analysis phases I and II.

Strategic IT Services Portfolio Management means the central management of all IT services of the Bundeswehr IT System across all technical areas and organisations. It covers the complete life cycle and aims to optimise the portfolio from a technical and economic point of view, with operations in mind. There is close interaction between IT Service Design and IT Service Portfolio Management. In accordance with existing procedures such as IPP and CPM (amended), and based on best practices according to ITIL®[1], the IT Service Management processes required for this are planned and introduced into the process landscape of

of strategic concepts becomes possible.

Branch P2.3 "Concept Development and Experimentation (CD&E), Modelling and Simulation (M&S) Tools, Knowledge Management" is in charge of implementing the guidelines from the Bundeswehr Concept and the subconcepts by creating an M&S landscape shared by the whole armaments sector. Integrating technical/technological solutions into a testbed environment allows for quick and effective testing. Using the VIntEL[2] system demonstrator, simulation systems already available at many agencies have been documented and connected. Through this project, an architecture providing a reliable coupling of real, simulation and C2 systems has emerged. In addition, an initial number of central services have developed that enable "Fair Fight" in a distributed simulation. These services now need to be subjected to further review in order to allow for a reliable interconnection of heterogeneous training simulators on the one hand, and to support the supply of geoinformation to simulation systems on the other hand. The evaluation of systems and the analysis of combat action are another two possible applications. For these

Terminology efforts by the Bundeswehr are aimed at establishing and maintaining an unambiguous technical vocabulary for all Bundeswehr processes not covered by the generally accepted Duden definitions. In this context, BAAINBw is one of the responsible agencies for technical and business-related terms. P2.3 is home to the terminology coordination centre coordinating BAAINBw's participation in nine terminology committees. The Branch itself participates in two terminology committees, "C² Support and IT" and "Operations and Conduct of Operations".

The knowledge management coordination centre aims to improve the work and C² processes tailored to the mission of the Bundeswehr by ensuring an effective and efficient handling of knowledge. This includes, first and foremost, the control and design of the prevailing conditions such as conceptual groundwork, HR, and organisational aspects. In practice, the range of tasks also includes training aspects, as well
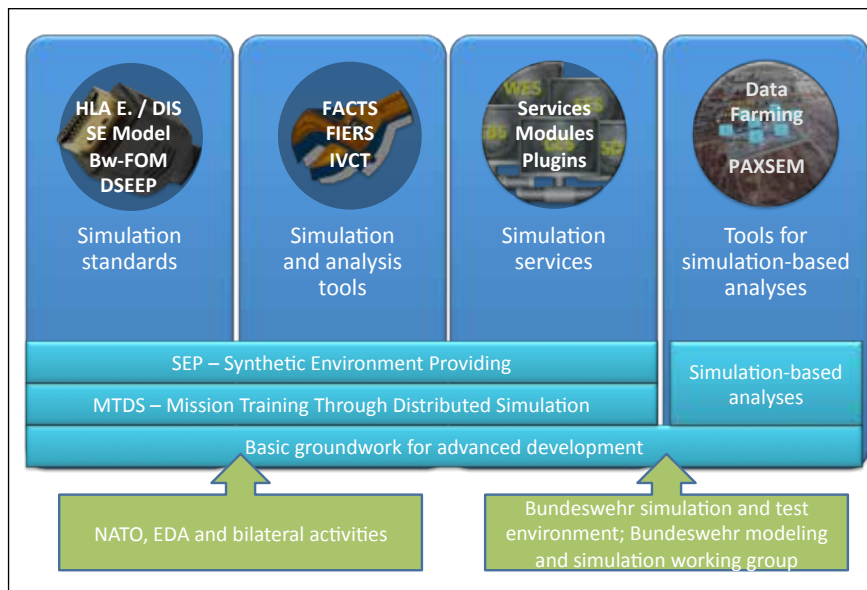
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1   IT Infrastructure Library

2   Distributed Integrated Test Environment

as practical IT support and trouble-shooting in day-to-day operations. At present, the knowledge management coordination centre at Branch P2.3 is involved in several IT platforms such as Wikis, SharePoint solutions, and the BAAINBw intranet site.

Branch P2.4 "International Cooperation" coordinates and controls, for all directorates, international interdisciplinary, project-independent defence cooperation within the area of responsibility of BAAINBw, and the German spokespersons and delegates of BAAINBw in international bodies. Branch P2.4 is the administrator of the central "International Cooperation

New Tasks

On 1 October 2015, the Directorate was expanded through the establishment of Divisions P3 and P4 and the integration of the Press and Information Centre (PIZ AIN), thus acquiring additional responsibility for central affairs. In order to provide the BAAINBw executive level with a comprehensive and centralised information basis and allow for harmonised communication, the Press and Information Centre, Central Controlling, Cabinet and Parliamentary Issues, as well as Federal Audit Office affairs were integrated into Directorate P.

is in charge of strategic controlling, project controlling, complex services controlling, resources and agency controlling, as well as advising directorate and agency controllers. Branch P3.1 analyses and evaluates the progress of armaments projects on a regular or incident-related basis. This is part of project controlling. In addition, an initial capability for viable risk management has been established at this branch. The results of subprojects within the armaments management (RüM) project will be taken into account for further planning.

Strategic Controlling at Branch P3.2 supports the management process at BAAINBw's executive level, which is directed toward medium-term and long-term objectives. Resources and Agency Controlling, in turn, allows for evaluations and recommendations to be made based on the quantitative representation of performance. It is aimed at making processes and performance more efficient. In the context of Complex Services Controlling, Branch P3.2 analyses and evaluates the progress of complex services on a regular or incident-related basis. What is more, P3.2 contributes to continuous performance reviews (BEK) regarding the outsourced services for vehicle fleet management (Bundeswehr-FuhrparkService GmbH, BwFPS), Armed Forces clothing (LH Bundeswehr Bekleidungsgesellschaft mbH, LHBw), and Army maintenance logistics (Heeresinstandsetzungslogistik GmbH, HIL) by preparing a special report. In order to ensure the uniform application of all controlling procedures in the directorates and agencies, P3 also acts as an advisor.

Division P4 encompasses Parliamentary and Cabinet Issues, Federal Audit Office affairs, and Internal Revision.

Branch P4.1 "Parliamentary and Cabinet Issues" is responsible for coordinating and answering all cabinet and parliamentary inquiries (e.g. major and minor interpellations, petitions, correspondence with the Parliamentary Commissioner for the Armed Forces) in cooperation with the competent elements within BAAINBw and its subordinate agencies. It also handles the preparation of political visits (by members of parliament, the FMoD executive group, etc.) to BAAINBw and its agencies. In addition, this Branch prepares information and documents required by BAAINBw's executive level for participation in the meetings of the Defence and Budget Committee. Concerning Federal Audit Office affairs, P4.1 manages in a leading capacity, all audit projects brought forward by the Federal Audit Office and the regional audit offices. It also coordinates the auditing affairs of Internal Revision. ■

Key R&T activities in the field of M&S

Database" (DBIZA). This database provides information on the results from international armaments bodies and cooperation programmes for spokespersons, delegates and the BAAINBw executive level. It is also BAAINBW's central point of contact with regard to all matters relating to OCCAR (Organisation Conjointe de Coopération en Matière d'Armement) and EDA (European Defence Agency), ensuring that German interests are represented in the context of international armaments cooperation during the reform and further development of the European testing landscape. Other tasks handled by P2.4 include the support of ITOPs (International Test Operating Procedures) and the consolidation of Test & Evaluation (T&E) capacities on a European level by using the DTEB (Defence Test and Evaluation Database). This Branch is also responsible for developing concepts for the support of foreign delegations as part of bilateral annual armaments programmes. The spectrum of issues covers the whole range of tasks of BAAINBw and its subordinate agencies.

The Press and Information Centre of the organisational area for Equipment, Information Technology and In-Service Support (AIN) handles information activities by being the point of contact for media representatives or citizens regarding any questions relating to the range of tasks covered by the AIN organisational area. When it comes to public relations work, PIZ AIN is responsible for any participation by BAAINBw in public events, and for creating multimedia information. What is more, the Centre also handles general media operations: evaluating press publications on a daily basis, preparing articles for various (specialist) magazines, and similar activities. In the AIN organisational area, PIZ AIN is also home to the online editorial team in charge of maintaining the BAAINBw's intranet and internet webpages, as well as providing conceptual support to AIN with regard to online work.

Division P3 "Risk Management and Controlling" is responsible for BAAINBw controlling tasks across directorate or agency boundaries, i. e. Central Controlling (ZC). It

Combat Directorate (K)

The BAAINBw Combat Directorate (K) is mainly responsible for weapon systems and their associated components. Projects focus on main battle tanks, armoured transport vehicles and a wide range of armament, air defence and artillery systems. The Combat Directorate is also in charge of infantry and engineer systems.

BAAINBw's technical expertise is split among four project divisions:
- Ground-Based Air Defence Systems (K3)
- Air-/Shipborne Weapon Systems, Anti-Armour Systems (K4)
- Armoured Combat and Transport Systems (K5), and
- Artillery, Infantry and Engineer Systems (K6).

These four divisions are supported by the interdisciplinary Divisions for Economic and Technical Affairs (K1) and Economic and Legal Affairs (K2), assisting them in project and in-service management as well as research and technology.

The Director of the Combat Directorate is supported by KAS Directorate Staff and KAC Directorate Controlling.

KAS Directorate Staff is responsible for central organisational and administrative matters relating to personnel, initial and further training and the organisational structure of the Directorate. KAS is the central point of contact for all members of Directorate K and an interface to the other BAAINBw directorates.

An essential element of command and control support, KAC Directorate Controlling analyses relevant project and performance data in preparation of executive decisions. Its main responsibilities are strategic controlling, project controlling, budget controlling and resource management.

The Economic and Technical Affairs Division (K1) supports the Directorate in technical and economic matters across projects. The K1 Division Chief is responsible for planning and realising all research and technology activities for ground-based weapon systems.

The Division is split into three branches.

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

Study results are immediately integrated into projects and analyses. Furthermore, K1.1 represents BAAINBw in international research and technology bodies.

K1.2 evaluates systems and assesses costs, i.e. supports the system-specific part in the development of weapon systems, evaluates the technical and tactical system performance and conducts cost-benefit analyses.
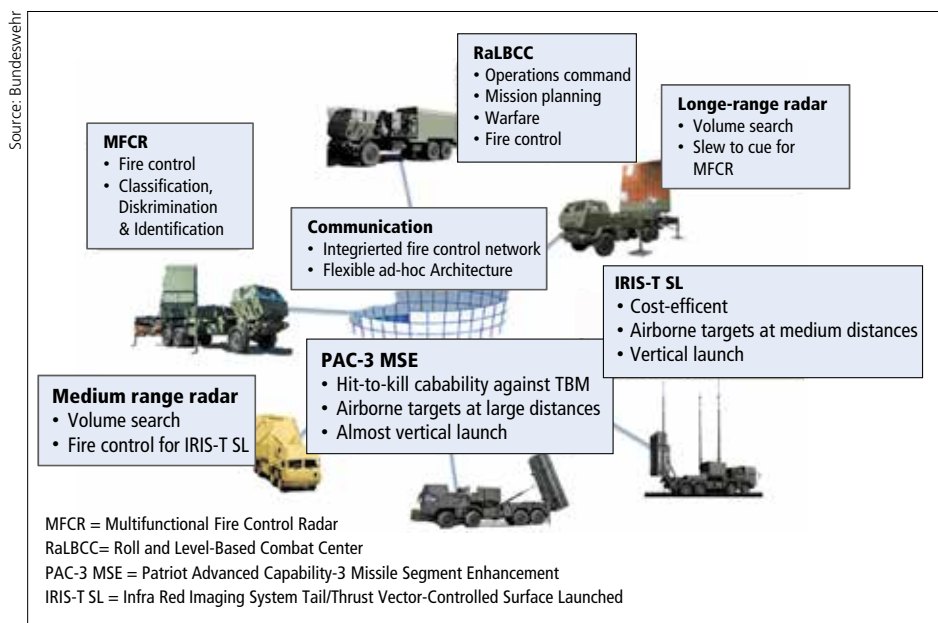
As another main task it also models and evaluates the effect of ammunition on ground and air targets. Particular importance is attributed to the protection against the latest threats to vehicles in operation. All directorates and projects deal with the various aspects of protection subsumed under the heading of "survivability".

Network centric operations, increasingly required by intelligent mobile platforms, are handled by K1.2 under the topic "systronics". National and international demonstrators such as the "Joint Operational Demonstrator for Advanced Applications" (JODAA) have already been presented in this context.

K1.2 also manages the "Joint Fire Support" programme.

Branch K1.3 is responsible for technical safety and documentation. This includes ensuring operational and functional safety of defence materiel and ammunition in particular. Projects are supported by material documentation. State-of-the-art technology helps developing "Interactive Electronic Technical Documentation" to support the users. K1.3 also manages projects on fuse technology and initiates appropriate research and technology studies. It takes care of all central matters of ammunition use and all interdisciplinary tasks and supervises the Bundeswehr Technical Center for Protective and Special Technologies (WTD 52) and the Bundeswehr Technical Center for Weapons and Ammunition (WTD 91).

The five branches of the K2 Division for Economic and Legal Affairs are in charge of public procurement, contract management and contract award for the Combat Directorate. These branches prepare, conclude and process contracts for the individual projects but also 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. The contract branches also support the projects in concluding national and international agreements. K2 also assists foreign nations which bought defence materiel from the Federal Republic of Germany in concluding and handling contracts with German industry. One branch of this Division is spe-

Source: Bundeswehr

MFCR
- Fire control
- Classification, Diskrimination & Identification

RaLBCC
- Operations command
- Mission planning
- Warfare
- Fire control

Longe-range radar
- Volume search
- Slew to cue for MFCR

Communication
- Integrierted fire control network
- Flexible ad-hoc Architecture

IRIS-T SL
- Cost-efficent
- Airborne targets at medium distances
- Vertical launch

PAC-3 MSE
- Hit-to-kill cabability against TBM
- Airborne targets at large distances
- Almost vertical launch

Medium range radar
- Volume search
- Fire control for IRIS-T SL

MFCR = Multifunctional Fire Control Radar
RaLBCC= Roll and Level-Based Combat Center
PAC-3 MSE = Patriot Advanced Capability-3 Missile Segment Enhancement
IRIS-T SL = Infra Red Imaging System Tail/Thrust Vector-Controlled Surface Launched

An overview of all TLVS sub-systems

Free-field test track

Free-field test track covered by tent

Construction of the land mine and IED detection facility in Oberjettenberg

cialised in matters of pricing regulations for public contracts and in charge of negotiating prices with contractors.

Two examples of the work done by the Combat Directorate are described below: the tactical air defence system project, and physical IED detection as part of functional supervision.

Tactical Air Defence System (TADS)

In June 2015, the Chief of Defence chose a new tactical air defence system for the Bundeswehr. From the mid-2020s onwards, it will replace the Patriot weapon system currently in use by the German Air Force.

The new TADS is a ground-based air defence missile system within the lower intercept envelope. It will have the ability to detect and engage airborne threats with a 360° coverage.
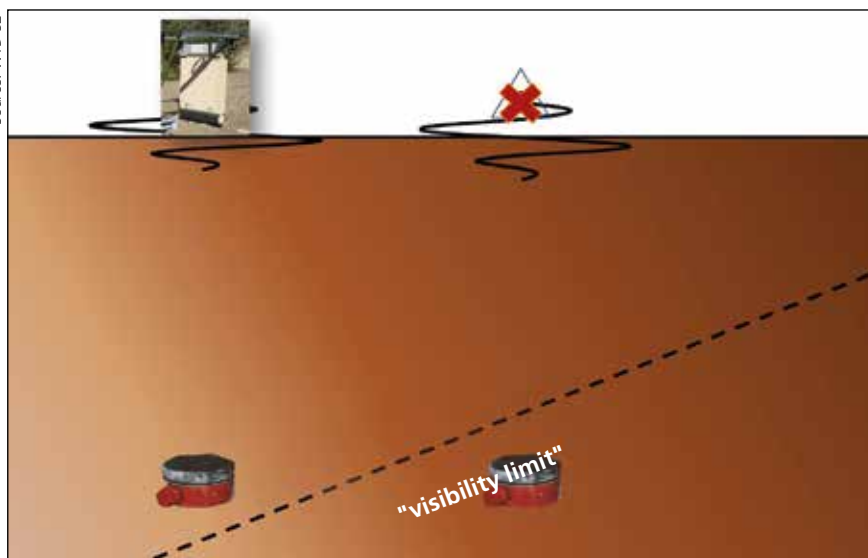
Simplified illustration of how ground properties affect the detection depth of a ground-penetrating radar. Note the "visual limit"

The TADS will thus be able to provide protection against current and foreseeable airborne threats such as helicopters, planes, UAV, and cruise missiles, as well as short and medium-range ballistic missiles. It can be used under all weather conditions and has been designed with network-centric operations in mind.

The new air defence missile system will allow Germany to make a significant contribution to NATO's capability profile with regard to ground-based air defence, particularly for the interception of tactical ballistic missiles within the lower intercept envelope. By utilising the system's various sensors and weapons, Germany can respond to future operational scenarios in a manner that is tailored to the threat and situation at hand. Specific modules, for example, will make the situation-based planning of operational contingents more effective and efficient. Furthermore, the TADS' open systems architecture supports a "plug & fight" option, i.e. the automatic integration of different system components into one overarching system, as well as total interoperability in accordance with NATO standards. This allows for a thorough integration of partner nations into one joint integrated air defence system.

Physical IED Detection

Improvised explosive devices (IED) have increasingly been a threat to our soldiers in many of the countries the Bundeswehr operates in, particularly in Afghanistan. In asymmetric conflicts, such devices are usually the weapon of choice for the technologically inferior party. They are a major cause of fatal and severe injuries of soldiers, local security forces, and civilians alike. In many cases, IED are hidden in the ground, e.g. beneath the road surface, making them hard or even impossible to detect

with the naked eye. There are, however, technologies that – under certain conditions – allow the detection of subsurface objects. The most successful IED detection systems available today make use of a combination of metal detectors and ground-penetrating radar (GPR).

Physical Detection

In the context of the reorientation of the Bundeswehr since 2012, the issue of physical IED detection has been assigned to the Bundeswehr Technical Center for Protec-

tive and Special Technologies (WTD 52). Its work includes identifying and facilitating new potential IED detection technologies, as well as compliance demonstration activities for innovative detection systems. In addition, WTD 52 takes part in the monthly meetings of the integrated project team (IPT) for the "German route-clearance system (GE RCSys)", contributing its specific expertise on this issue. WTD 52 also chairs a subgroup of the Armaments Working Group on C-IED. Any matters relating to

physical IED detection are discussed in the working group and managed by K6.4, the competent branch of BAAINBw. WTD 52 is also in charge of projects and studies regarding physical IED detection and promotes international cooperation in this field.

The necessary studies, trials and tests require a specific infrastructure to ensure that specific basic conditions (including different types of IED, varying environmental conditions, and diverse soil compositions) can be adequately simulated. For this purpose, WTD 52 has a unique test environment at its disposal. The year 2014 saw the completion of a free-field test facility for vehicle-mounted IED detection systems. This facility consists of six test tracks, each of them approx. 13 m long and 5 m wide. Each of the test tracks has been furnished with a different ground surface to include many different degrees of difficulty when testing a broad range of detector systems. Special attention is paid to ensuring that tests are comparable, regardless of the specific deployment area.

To make sure that the tests conducted at the free-field facility can be reproduced, the impact of weather conditions has to be eliminated as far as possible. To this end, a tent provides provisional coverage for the free-field test tracks.

Geophysical ground analysis at WTD 52

At present, WTD 52 is building another test environment – an almost metal-free facility for land mine and IED detection – to meet the physical IED detection requirements of the future. Due to its special type of construction, the detector systems to be tested will remain mostly unimpeded by interferences from metal components in the facility structure. The new facility is also unique due to its dimensions: it is a building 70 m long, 20 m wide and has a ceiling height of 4.5 m. Once it has been completed, it

will feature six detection tracks with different surface types. This land mine and IED detection facility in Oberjettenberg will be used as a technical test centre for hand-held and vehicle-mounted systems for the physical detection of IED.

Core Principles of Physical IED Detection

The infrastructure created at WTD 52 is used for compliance testing of physical IED detection systems. The systems most widely used today combine a metal detector and a ground-penetrating radar.

Metal detectors include, as a minimum, a search coil and a receiving sensor, plus the necessary electronics and software. A low-frequency alternating current passes through the search coil, producing a magnetic field. If this field meets a metal object, the object itself will produce another field which can then be detected by the metal detector's receiving coil. The efficiency of a metal detector significantly depends not only on the system's particular characteristics but also on the ground's magnetic permeability. Metal detectors are, however, not suitable for detecting nonmetallic IED. A ground-penetrating radar (GPR) bridges this gap. Ground-penetrating radars, like other sensors, require electronics and software; in addition, they comprise transmitting and receiving elements. Based on the radar principle, electromagnetic waves are emitted into the ground. Then, the returning reflections are analysed. Just as with metal detectors, the efficiency of a GPR is limited by ground characteristics such as attenuation or electric permittivity.

Under certain ground conditions, IED cannot be detected by a GPR. In order to tackle this risk, adequate methods and procedures for ground analysis and assessment are required.

The Hanover-based Leibniz Institute for Applied Geophysics (LIAG) is currently cooperating with WTD 52 to examine an easy-to-use ground analysis procedure which would allow users to decide whether or not using a GPR makes sense under the given ground conditions. If the examination is successful, this ground analysis procedure might be integrated into a commercial device. After successful development, this ground analysis procedure may then become part of the GE RCSys and its supplementary systems.

Current Testing

At the moment, planning for compliance demonstration activities regarding the FUCHS KAI ATV is going full speed at all BAAINBw agencies involved. The FUCHS KAI ATV is a supplement to the GE RCSys, a combination of vehicles used for detecting and clearing subsurface IED. The FUCHS KAI ATV was designed to support the search for IED placed along road margins and hard-to-access locations. It is a modified version of the FUCHS ATV augmented by detection, recce and manipulation components.

For the most part, the detection systems currently available and undergoing testing can detect IED only once the detector vehicle is right above the object posing a threat. It would be preferable to have detection systems capable of detecting IED from a longer distance as this would significantly reduce the risk to our own forces. To this end, a forward-looking radar is in the pipeline.

While there have been some promising impressions, the forward-looking radar technology tested is not yet what one might call "marketable". There are still several years of research work to go. ■

Combat Directorate – Glossary

Project	managed by
Multi-option mortar/artillery fuse	K1
Joint Fire Support (JFS)	K1
PATRIOT (upgraded)	K3
MEADS	K3
SysFla air defence system	K3
NBS C-RAM (close-in range counter rocket artillery mortar) air defence weapon system	K3
TORNADO precision weapon	K4
EUROFIGHTER precision weapon	K4
FUCHS ATV: improvement of protective properties	K4
90 mm direct/indirect fire effector for special operations forces	K4
MELLS weapon station	K4
Laser target designation system	K4
TAURUS 2.1 MSOW for engagement of infrastructure targets	K4
RAM Block 2 ship-to-air guided missile	K4
ESSM ship-to-air missile	K4
Standard Missile 2 (SM 2) ship-to-air missile	K4
RAM upgrade	K4
IRIS-T short-range air-to-air guided missile	K4
METEOR medium-range air-to-air guided missile	K4
PUMA armoured infantry fighting vehicle	K5
WIESEL 2 armoured tracked vehicle	K5
BV 206 S	K5
FENNEK scout vehicle	K5
BOXER MRAV	K5
Upgrade of 120 mm tank gun for LEOPARD 2 MBT	K5
30 mm KETF (kinetic energy time fuse) cartridge	K5
30 mm x 173 LS practice cartridge	K5
120 mm x 570 HE cartridge	K5
Recoilless naval gun	K5
Mortar combat system command vehicles	K6
PzH 2000 self-propelled howitzer	K6
MARS/MLRS GMLRS guided rocket	K6
Rocket launcher upgrading	K6
120 mm mortar delivery platform	K6
155 mm HE MOD 2000 projectile	K6
120 mm high-explosive mortar cartridge NG	K6
Multispectral 120 mm mortar smoke shell	K6
120 mm infrared illuminating mortar shell	K6
155 mm projectile (smoke, multispectral)	K6
FENNEK equipment	K6
GFF/GTF mobile weapon station	K6
Follow-on generation MG	K6
Instrumentation for armoured vehicle-launched bridge	K6

Air Directorate (L)

The Air Directorate (L) of the Federal Office of Bundeswehr Equipment, Information Technology and In-Service Support (BAAINBw) is responsible for the management of all aviation projects. When Directorate L assumed Material Responsibility for Operational Viability, in-service support tasks were added to its original tasks such as realisation. The in-service and supply responsibility, however, remains with the services.

This meant that the Air Directorate (L) had to take over a large number of tasks from the services previously responsible, particularly from the Air Force. For the purpose of handling these tasks, Directorate L has doubled its number of posts – particularly military posts – to approx. 750 by incorporating personnel from all services. Directorate L deals with important major projects as well as aeronautical equipment. The spectrum ranges from very agile fighter jets, transport and special aircraft, state-of-the-art helicopter systems, unmanned aerial vehicles, tactical UAVs and space-based reconnaissance systems down to crew rescue and protection systems, simulators as well as training equipment. Furthermore, Directorate L is responsible for maintaining the operational viability of weapon systems in use which have been introduced recently or many years ago.

Almost all major projects are managed by multinational – mainly European – partnerships and management agencies.

Directorate L monitors its (weapon) systems over the entire course of the project in accordance with the amended Customer Product Management (CPM) procedure covering the following aspects:

- system-related research and technology,
- participation in the analysis phase in cooperation with the Planning Office (partly via Directorate P) as well as in
- the realization and in-service phase by means of management and support of all projects regarding manned and unmanned aerial vehicles (aircraft) as well as flying or space-borne reconnaissance systems of the Bundeswehr as well as
- system engineering and integration of subsystems including armament.

This includes high-priority procurement in the context of "fast-track initiatives for operations".

Structure

Directorate L is structured as follows according to its tasks and products:
The "Economic and Technical Affairs" Division (L1) currently comprises five branches and deals with cross-sectional and cross project tasks of the Air Directorate.

- Branch L1.1 is responsible for topics dealing with defence research and technology (R&T). The so-called task area 30 "Aerospace Systems" is particularly characterised by the research on and provision of concepts and technologies for manned and unmanned aerial vehicles (helicopters and fixed-wing aircraft) including the associated aspects such as functional on-board systems, mission planning and management, avionics, flight guidance, flight control and cognition as well as aviation propulsion systems. Specifically, the tasks are focused on unmanned aircraft systems (UAS), aircraft propulsion systems, system concept and associated technologies for a Future Combat Air System (FCAS), increase of the degree of automation (not only) for rotary wing aircraft taking into consideration crew assistance systems, certification and teaming as well as on a stratospheric platform for C4ISR[1]. These topics are handled at national as well as international level (e.g. EDA or NATO); thus, an overarching analysis and assessment capability has to be ensured.
- For organisational reasons, the designation of branch L1.2 has not been determined yet.
- L1.3 is responsible for aspects regarding the in-service use of aerial systems, technical supervision of the Bundeswehr Technical Center WTD 61 in Manching, questions of flight safety such as the handling of aircraft accidents/incidents as well as for issuing special flight operations waivers (flight operations on weekends, supersonic and low-level flights).
- L1.4 is responsible for materiel documentation regarding status 5 (= Air Force) materiel as well as materiel under the in-service and supply responsibility of the Chief of Staff, Air Force that is used by other Bundeswehr major organisational elements.

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1 Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance

- L1.5 is responsible for "software maintenance of flying weapon systems" and cooperates closely with the Systems Center 14 in Manching.
- L1.6 provides the specialist competence for aviation-specific product families as well as for common ground support and test equipment, maintenance depot equipment and training equipment.

Furthermore, it is intended to set up a central branch responsible for depot level maintenance planning and control.

The "Economic and Legal Affairs" Division (L2) – consisting of altogether five contracting branches provides project support with respect to contractual/legal issues (contracting branches L2.1 to L2.4) and is responsible for price negotiations (Branch L2.5) in the context of contract negotiations and administration. Furthermore, Division L2 provides project support within the scope of international negotiations and agreements.
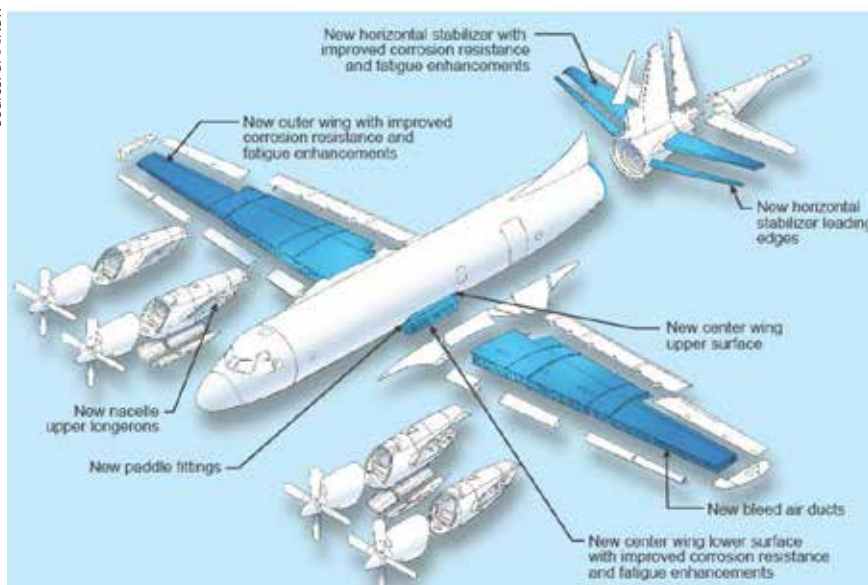
The additional L3 to L7 divisions of the Air Directorate are particularly product- and project-oriented. The L3 to L7 divisions are mainly responsible for managing and/or monitoring products and services within the aforementioned spectrum over their entire life cycle. The individual divisions have the following responsibilities:

- L3: In-service transport and special aircraft, MPA P-3C, TORNADO, rescue, special flight and parachute systems, aviation-specific aspects within the current regulatory space. In this context, it should be noted that L3 supports the holder of the military type certification in exercising his/her duties;
- L4: all Bundeswehr helicopters/rotary wing aircraft;
- L5: Airborne and space-based reconnaissance systems, electronic warfare (EW) including unmanned aerial vehicles;
- L6: EUROFIGHTER and
- L7: A400M.

The Directorate Staff (LAS) supports the Director in administrative matters. Furthermore, the Directorate Controlling organisation (LAC) is responsible for the project-related data processing for continuous time, performance and cost monitoring.

Photo: MFG3 picture library

P-3C during flight with extended MX-20 camera

Source: BAAINBw

New horizontal stabilizer with improved corrosion resistance and fatigue enhancements

New outer wing with improved corrosion resistance and fatigue enhancements

New horizontal stabilizer leading edges

New center wing upper surface

New nacelle upper longerons

New paddle fittings

New bleed air ducts

New center wing lower surface with improved corrosion resistance and fatigue enhancements

Schematic representation of the repair work

A detailed explanation of all weapon systems and their associated simulators, training equipment, facilities etc. would be far beyond the scope of this article. Therefore, a few selected projects of the Air Directorate are presented below which are representative of the large number of projects and the broad spectrum of project tasks:

P-3C ORION Maritime Patrol and Anti-Submarine Aircraft

In June 2014, the Chief of Defence decided to extend the service life of the P-3C ORION maritime patrol and anti-submarine aircraft. Based on this decision, extensive measures to maintain the weapon system's capability until 2035 were initiated. In this context, three major upgrade projects were initiated to ensure the weapon system's operational readiness over this period. On 1 July 2015, all three projects were

approved by the German parliament and the respective contracts were concluded shortly afterwards.

The aircraft taken over from the Netherlands between 2004 and 2006 in used condition show strong signs of fatigue and corrosion in the wing area requiring extensive repair work.

The purpose of the "Rewinging" project is to replace the wings and horizontal tail by new parts. To this end, a contract with a consortium consisting of the original parts manufacturer – Lockheed Martin – and the integrator – Airbus – was concluded to realise these extensive measures by 2023. Since the acoustic processors and the weapon computer, which are highly important for antisubmarine warfare, are obsolete, major parts of the mission avionics have to be exchanged because supply and maintenance of the old parts are no longer provided. Since the systems to be replaced include software components in which the US Navy has property rights, this modernisation measure is performed as Foreign Military Sales (FMS) case under US Navy control. This means that configuration control of the hardware and software that is subject to restrictions in accordance with the International Traffic in Arms Regulations (ITAR) is ensured. To this end, the US Navy will conclude a contract with the original aircraft manufacturer – Lockheed Martin – which in turn will award a subcontract to Airbus for the integration. The respective Letter of Acceptance (LOA) was signed on 6 July 2015.

The equipment currently used for instrument flight no longer complies with the legal requirements. Furthermore, there are major problems with respect to communication and navigation due to obsolescences. Thus, a prototype installation for the exchange of significant navigation and communication components was performed within the scope of the project

Photos: Bundeswehr

LUNA airborne unmanned short-range reconnaissance system; launch in Afghanistan

"Maintaining the Instrumented Flight Rules (IFR) capability". Airbus is the prime contractor and Rockwell Collins (USA) as well as Rohde & Schwarz are the major subcontractors.

The necessary change projects altogether comprise a financial volume of almost €600 million, and the branch with lead responsibility will have a large amount of coordination work over the next few years since the upgrade measures are partially performed in parallel to other maintenance and repair tasks to further ensure maximum operational availability of the aircraft.

KZO target acquisition drone (Kleinfluggerät Zielortung)

HUSAR – the Future Tactical Air Reconnaissance System of the Army

The plans for the future tactical unmanned air reconnaissance system of the German Army were based on the highly important mission-relevant reconnaissance requirements, which continue to increase in quality and quantity. Since the planned service life of the systems used so far – LUNA and KZO – will end in 2020, the German Army will be confronted with a capability gap in the field of airborne reconnaissance in the range of up to 100 kilometres.

Based on this, the HUSAR (Hocheffizientes Unbemanntes System zur Aufklärung mittlerer Reichweite – Highly efficient un-

manned system for medium range reconnaissance) project was already started in 2012 in order to replace the LUNA and KZO systems in due time by a successor system adapted to the extended Army capability requirements in this field. The requirements to be fulfilled by such a system have been summarised in the "Capability Gap and Functional Requirement" (FFF) document under the project name "Abbildende Aufklärung in mittlerer Reichweite für bodengebundene Operationen" (Medium-range imagery reconnaissance for ground-based operations, AAmRbO). The system's technical core parameters are summarised as follows:

- maximum mobility and availability due

to operation, take-off and landing capability without using fixed structures;
- ballistic protection for the operators;
- endurance of more than 12 hours;
- reconnaissance ranges of up to 100 kilometres;
- operating altitudes of up to 6,000 meters (International Standard Atmosphere, ASL) and
- use of an efficient, commercially available and modular multi-sensor system.

In order to ensure sustainable operation of the new system within the entire operational area of the Bundeswehr – particularly with respect to common operations with partner nations – while meeting future needs, the standardisation agree-

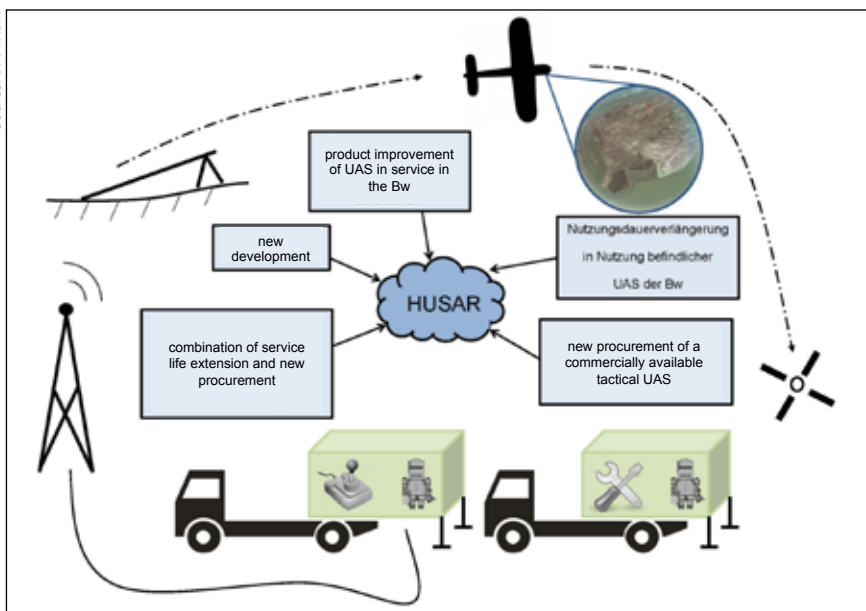*Proposed solutions currently investigated based on the user requirements*

ments of the NATO nations applicable to tactical UAS are consistently taken into consideration. In addition to the certification-relevant Bundeswehr regulations, the requirements laid down in STANAG 4703 "Unmanned Aerial Vehicle (UAV) – Systems Airworthiness Requirements light" are also applicable.

In order to meet the user's core requirements such as mobility and quick availability as well as to minimise the system's logistic, infrastructural and personnel footprint and provide an economic cost calculation for the next few years, a modular structure of all system components (including modular training) as well as the limitation of the UAV maximum takeoff weight to 150 kilograms is considered to be essential for the system.

The competent Branch L5.2 is currently responsible for preparing detailed solutions within the scope of the established Integrated Project Team (IPT). On the basis of these solutions, the Chief of Defence will make a decision. Based on current plans, the first new HUSAR system will be available in the second half of 2018 and service use will start in 2019.

With respect to its intended system performance, the HUSAR system perfectly fits into the overall UAS Bundeswehr concept and supplements the Medium Altitude Long Endurance (MALE) as well as the High Altitude Long Endurance (HALE) systems of the German Air Force at low altitude.
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Air Directorate – Glossary	
Designation	**Branch**
Renewal of the medium and long-haul fleet of the FMoD special Air Mission Wing	L3.1
Maintenance of long-range maritime reconnaissance and anti-submarine warfare capability until 2035	L3.2
Integration of MIDS multifunctional information distribution system into TORNADO aircraft	L3.3
Chaffs / Infrared decoy container for TORNADO aircraft	L3.3
Upgrading electronic warfare TORNADO aircraft (IDS/ECR versions)	L3.3
Upgrading TORNADO aircraft display	L3.3
Service life extension of TORNADO aircraft	L3.3
Product improvement CH-53 G	L4.1
Light utility helicopter for Special Forces	L4.1
Sensor based landing aid for CH-53	L4.1
TIGER support helicopter	L4.3
NH-90 helicopter for transport and naval operations	L4.4
Airborne, long-range SIGINT surveillance and reconnaissance system (SLWÜA)	L5.1
Deep theatre reconnaissance and imaging system (Heron 1)	L5.1
Unmanned imaging reconnaissance and surveillance in the depth of the theatre of operations	L5.1
Sea-based reconnaissance drone (AlmEG); reconnaissance and identification in the maritime theatre of operations	L5.2
Medium Range UAS	L5.2
Radar satellite system for worldwide imaging reconnaissance (SARah)	L5.3
Optical satellite system for worldwide imaging reconnaissance	L5.3
Radar jamming system for Bundeswehr aircraft	L5.4
EUROFIGHTER aircraft	L6
AESA radar for EUROFIGHTER weapon system	L6
A400M electronic warfare; DIRCM self-protection equipment	L7
A400M transport aircraft	L7

Sea Directorate (S)

The Sea Directorate is centrally responsible for matters related to armaments and the in-service use of ships and boats of the German Navy, navy-specific shore-based facilities, communication systems and training facilities as well as other navy-specific equipment. It manages the units from the first procurement phases to their disposal. Thus, the directorate assumes the single manager responsibility for its assigned units, facilities and equipment "from the cradle to the grave".

The Sea Directorate consists of a total of six divisions with different tasks and of the Directorate Staff and the Directorate Controlling. Organisationally, three project divisions deal with the units afloat:

- Surface (frigates, corvettes and MKS 180) (S3);
- Subsurface (submarines, mines, mine countermeasures, subsurface weapon systems) (S4);
- Support Units, Auxiliaries and Support Systems (S5).

A project manager (PM) is responsible for the armaments management and in-service support of one ship class. The project managers head "integrated project teams" in all phases of the CPM (amended).

In addition to the project divisions, the Sea Directorate also comprises three functional divisions which support the projects. These are the Economic and Technical Affairs Division (S1), the Economic and Legal Affairs Division (S2) and the Navy C2 Systems Division (S6). The six divisions are interconnected in a matrix organisation.
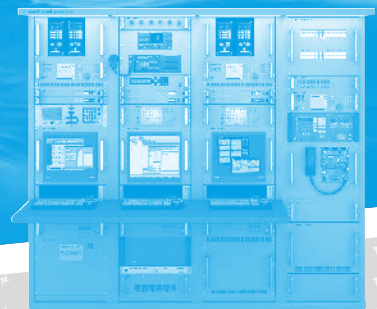
Starting in the pre-analysis phase, the Economic and Technical Affairs Division prepares new ship concepts in close cooperation with the Equipment Management Division of the P Directorate and the Bundeswehr Planning Office. The required technical and economic contributions are based on the results of a timely planning of the study and research activities with respect to contents and schedule in order to be able to determine the costs in a goal-oriented way. The branch responsible for functional supervision (S1.1) is the control element for the Bundeswehr Technical Center for Ships and Naval Weapons, Maritime Technology and Research (Wehrtechnische Dienststelle für Schiffe und Marinewaffen, Maritime Technologie und Forschung – WTD 71) and the Naval Arsenal (Marinearsenal – MArs). The division lays the conceptual, technical and logistical groundwork for the projects and provides support in all issues concern-

F125 NORDRHEIN-WESTFALEN after undocking in Hamburg

ing naval engineering and with regard to the certification of all military maritime capability platforms. In addition, the division is responsible for projects if the material of different ship classes is affected cross-sectionally.

The Economic and Legal Affairs Division is in charge of all contracting and pricing issues.

The Navy C2 Systems Division supports the project managers and the Navy during the complete life cycle of combat direction systems (CDS) and other important IT-based complex subsystems like automation systems, marine message handling systems (MMHS) or tactical data links (TDL). Furthermore, the S6 Division manages IT-based cross-sectional products of maritime shore-based facilities, communication systems and training facilities and is also responsible for the approval of the above-mentioned IT systems with regard to software safety and IT security.

The Sea Directorate is completed by the Directorate Controlling and the Directorate Staff. The Directorate Staff handles any organisational and personnel-related matters, while the Directorate Controlling provides advice to the Director regarding management and control of the procurement and in-service process.

Status of the Class 125 Frigate Project

The four new class 125 frigates (F125) were designed for multinational, joint military operations of low and medium intensity.

Its design was dictated by several important requirements: heavy use, worldwide operation and defence against asymmetric threats.

In order to be able to support long-term stabilisation missions, the F125 was designed to allow for in-theatre deployment periods of up to two years without planned yard periods and with 5,000 underway

steaming hours per year. The crew was reduced to about half the size of the previous F122, F123 and F124 classes. It is planned to have a permanent crew of 120 members. A number of extensive studies regarding operational procedures, system availability and crew workload were conducted in order to implement the requirements regarding intensive use and the crew concept.

Apart from the selection of robust and low-maintenance systems and installations with a high degree of automation numerous additional technical and organisational measures are derived from the results. As far as possible, the verification of the intensive use capability will be demonstrated during ship construction until 2016. However, the actual "acid test" will be carried out by the Navy in the context of a 12-month operational suitability test.

The F125 is equipped with innovative sensors and weapons providing good surveillance, target detection, target tracking and

effective target engagement capabilities to counter asymmetric threats, particularly at short and very short range. The sensor suite includes, among other things, an all-new TRS-3D NR (non-rotating) radar, optronic components for short and very short range surveillance, as well as a diver detection sonar. The F125's armament suite supports gradual, selective and precise effects. The ships are equipped with remote-controlled 12.7 mm Heavy Machine Guns (HMG) and two 27 mm naval recoilless guns (MLG 27) to counter asymmetric threats. The RAM (Rolling Airframe Missile) close-in weapon system and the MASS (Multi Ammunition Softkill System) decoy launcher protect the F125 from conventional threats. For long-range weapon effects, the vessel was outfitted with HARPOON anti-ship missiles and Oto Melara's new 127mm/L64 gun which allows for naval gunfire support with high-precision VULCANO ammunition.

In addition to two shipboard helicopters the F125 has four 10 m tactical boats.

ARGE F125, a joint venture of ThyssenKrupp Marine Systems and Fr. Lürssen Shipyards, is in charge of the construction of the vessels. In December 2013, the first class 125 ship, the BADEN-WÜRTTEMBERG, was christened at Blohm & Voss in Hamburg, followed by the NORDRHEIN-WESTFALEN on 16 April 2015. The production and outfitting of the BADEN-WÜRTTEMBERG have almost been completed; currently extensive activities regarding the commissioning of the equipment and systems are ongoing. These will lead to the testing of the weapon system at sea (contractor trials) in April 2016 and the final acceptance trials of the employment systems in January 2017.

The Bundeswehr is facing the challenge of maintaining the capabilities of the class 123 frigates for operations

According to current planning, the delivery of the first ship is scheduled for the end of May 2017, with the other vessels following until the beginning of 2020. Progress has also been made as far as the shore-based facilities associated with the project are concerned. On 20 August 2015 the first complete shore-based system for the F125, the training facility for the Naval Operations School (Marineoperationsschule – MOS), could be handed over to the Navy.

Completion of K 130 Integrated Compliance Demonstration

The operational suitability test of the RBS15 Mk3 heavy antiship missile was the last pending test in order to prove initial operational capability of the material of the class 130 corvettes and took place in the context of the integrated compliance demonstration at the sea range off the coast of North Sweden.

Under the direction of the Bundeswehr Technical Center for Ships and Naval Weapons, Maritime Technology and Research (WTD 71) and supported by the German Navy and the Swedish government the antiship missile was fired successfully from the MAGDEBURG corvette and followed the flight profile specifically developed for this test according to plan. Among other things, the missile demonstrated its capability for independent re-attacks.

Since August 2015, after the evaluation of the test results and the approval of the RBS 15 Mk3 functional chain, it has been possible to equip the class 130 corvettes with the RBS 15 Mk3 heavy antiship missile.

The RBS15 Mk 3 is an antiship missile with a range of approximately 200 kilometres. Flight path and flight altitude can be modified several times by means of programmable waypoints in order to approach targets from virtually any angle. Stream attacks with several missiles approaching the target at different trajectories at the same time are supported by the programmability. The final approach takes place closely above the water surface with active radar homing. In order to make it more difficult for enemy close-in defence systems to intercept the RBS15, the missile is capable of conducting evasive manoeuvres during the final approach phase.

Maintaining the Material Operational Capability of Class F123 Vessels

Since the commissioning of the ships approximately 20 years ago they have been used by the Navy and have proven their

U212A in the Kiel Fjord during winter

worth in numerous international operations.

However, the limits of supportability will soon be reached for essential parts of the combat direction system (CDS) and the fire control systems as well as other important engineering systems due to age and obsolescence. The Bundeswehr is now facing the challenge of maintaining the capabilities of the class 123 frigates for operations, especially in terms of antisubmarine warfare (ASW), ship automation and for the use as a command platform. The measures for maintaining the material operational capability are summarised in an overarching project plan, the so-called "F123 master plan", which is the basis for all planned system-relevant conversions and also takes into consideration technical and contractual interdependencies as well as financial planning parameters of all required individual actions.

In terms of capability maintenance measures the focus is on new tactical radars and fire control systems, the conversion to the ESSM missile[1], the RAM Block 2 integration as well as the modernisation of the engineering automation system and the gyro compass system.

The main feature of the capability maintenance program is the combat direction system (CDS). Therefore, the "F123 capability adaptation" is an important major German naval armament project and is also a significant element in terms of maintaining the material operational capability of the class F123 vessels.

The Class U212A Submarines

The class 212A submarines (U212A) are mainly required for covert reconnaissance, the engagement of sub-surface and surface targets and the transport of special forces. They are particularly difficult to

1   Evolved Seasparrow Missile

detect and are equipped with an air-independent fuel cell propulsion, long-range sonars and an adapted armament suite. The submarines are considered to be almost "invisible" because they can operate submerged for a significantly longer period of time than comparable diesel-electric powered submarines. The four submarines of the first batch will be complemented by the two submarines of the second batch. The submarines are procured in the context of a successful German-Italian cooperative project and supported jointly during the in-service phase. Four German and two Italian submarines of the first batch have already been commissioned, which means that currently there are six submarines in service. Both nations have ordered two additional submarines each in the second batch. The goal of the cooperation is to have as many identical components as possible in order to enable a reduction of costs during the procurement and in-service phases and a high degree of operational interoperability. During the in-service phase questions are aligned and common solutions for occurring problems are sought. Among other things, the spare parts and exchange items are stored jointly and the software maintenance for the basic combat direction system is also done together.

So far, the submarines of the first batch (U31 to U34) have been able to meet the high expectations of the Navy during operations. U212A sets new standards in terms of low-frequency acoustic detection, has excellent manoeuvring qualities and is extremely hard to detect for enemies.

The modifications of the second batch are based on the extended operational requirements and the experience gained to date. It has to be emphasised that the submarines of the second batch have been provided with improved equipment for covert operations of special forces. A diver lockout chamber in the conning tower significantly accelerates the previously time-consuming

leaving procedure via the weapon tubes and also makes it safer for the personnel involved. Depending on the operational requirements, material needed for special forces operations can be carried in removable pressure-resistant exterior containers. In addition, the technical prerequisites for the participation in network-centric operations have been improved.

The operational range required for future global operations is achieved by an increase in fuel capacity and improvements in the field of hydrodynamics. The submarines are prepared for the climatic requirements of operations in tropical sea environments by the appropriate adaptations of the air-conditioning systems and chilled water units. As a result of these measures the submarines of the second batch are approximately 1.2 m longer.

With the new flank array system it is now possible to detect subsurface targets more precisely. If necessary, an active sonar can also be used to reconnoitre the underwater situation. The integration of LINK 11 and 16 as well as SHF-SATCOM (Bundeswehr satellite communication system) resulted in an improvement of the communication capability compared to the submarines of the first batch. All submarines are armed with the DM 2 A4 heavyweight torpedo. There are plans to equip the submarines with a guided missile in the future. This would enable the submarine to defend itself against airborne detection attempts by enemy forces. Such a system would also offer better options in terms of effectiveness, precision and escalation capability, for example in order to be able to react to asymmetric threats in an appropriate way. The acceptance commission of the public purchaser accepted the first submarine of the second batch in September 2014. The final acceptance trial of the second submarine is scheduled for the third quarter of 2016.

Class 180 Multirole Combat Ship (Mehrzweckkampfschiff – MKS 180)

Once the Bundeswehr Chief of Defence had chosen the "Future Modular Maritime Capability Platform" (MKS 180) on 8 June 2015, all necessary actions for the start of the realisation phase of the MKS 180 project were taken. One of the first milestones was the publication of the request for interest for the MKS 180 procurement on 16 July 2015.

In the context of the selection decision the proposed solution which covers the complete capability profile of the capability gap and the MKS 180 functional requirement was chosen. During the analysis phase the

MKS 180 Integrated Project Team had prepared two additional solutions that did not meet all the requirements and thus involved a reduction in costs. One of the crucial factors for the decision was the combat power of the selected proposal. Among other things, MKS 180 will have the capability to engage air targets up to close range, sea targets up to long range, sub-surface targets (with shipboard helicopters) and asymmetric targets in the immediate vicinity of the ship. In addition, MKS 180 will be designed for the engagement of enemy surface forces and asymmetric threats, but also for sea surveillance, the enforcement

of embargoes, the support of special forces as well as evacuation operations.

The range of tasks can be extended by the installation of special mission modules which in this form are a novelty for the German Navy. Mission modularity refers to the capability to adapt a ship to certain operations with standardised equipment and personnel packages. The following mission modules are planned:
- "ASW operational picture" (Anti Submarine Warfare) with a towed array sonar for subsurface situation pictures;
- cells for the preliminary detention of individuals;

- "MCM" (Mine Countermeasures) for the engagement of underwater explosive ordnance (sea mines) or
- "diver pressure chamber"" to support diving operations.

The construction contract will comprise the design, construction and delivery of four class 180 multirole combat ships. Since the structural demand of the Navy justifies the procurement of six units sufficient provisions will be made for the procurement of two additional units within the scope of the contract at a later date.

For the first time, a "negotiated procedure with a call for competition" in accordance with Section 11 (1) of the Act on the Award of Public Contracts in the Fields of Defence and Security (Vergabeverordnung für die Bereiche Verteidigung und Sicherheit – VSVgV) is applied for such a major project. The negotiated procedure grants the customer the opportunity to first of all negotiate indicative and therefore non-binding offers in several consecutive rounds of negotiations in order to further specify the subject of performance. Subsequently, the bidders are invited to submit their best and final offer. The most economical offer will then be accepted. Bidders may be rejected during the negotiations on grounds of previously announced criteria.

The aim is to complete the award procedure with the submission of a finalised construction contract in 2017. The construction contract will only be concluded after parliamentary approval. This approach is highly ambitious both in terms of schedule and content and does not only require very efficient project management but possibly also structural and organisational adaptations. The delivery of the first ship (First of Class) is planned for 2023.

Project and In-Service Support Management

The S5 division combines the project and in-service support management for all support units of the German Navy, the fleet of the defence engineering sector and the Naval Arsenal. In addition, the S5 division covers the technical aspects of fields like communication and navigation for all naval units.

The S5.1 project branch is responsible for the complete project and in-service support management of the combat support ships, intelligence collectors and tenders belonging to the German Navy. The extremely high intensity of use with frequently changing operational requirements calls for constant adaptations, sometimes at very short notice, as currently observed in the humanitarian missions of the tenders in the Mediterranean. The predominately old age of the units poses particular challenges when it comes to ensuring their operational readiness. Comprehensive midlife adaptations of the combat support ships from the first batch are carried out as independent projects in line with the repair and operations of the ships. Apart from the technical and planning tasks the fields of logistics and logistic supportability have gained more and more importance.

The S5.2 branch plays a special role because it is technically responsible for all Navy support systems of the Sea Directorate as far as electro-optics, electronic warfare, radar, navigation and communication are concerned. In addition to studies on how to maintain the capabilities of tactical radars on the class F123 frigates and the cross-functional regeneration of the ECDIS/AIS radar navigation system, the improvement of morale and welfare communications is currently of paramount importance. At

present, implementation proposals for this purpose are being prepared. Furthermore, this branch coordinates the installation of morale and welfare networks and modern SATCOM systems in order to enable the soldiers to have private communications via Skype, e-mail and messenger.

The S5.3 branch is responsible for the auxiliary and support vessels and the defence fleet. Among other things the branch deals with the sail training ship GORCH FOCK and the units used at the Navy bases and ports which assume logistic tasks, e.g. the refuelling, towing and moving of units (harbour tugs), collect waste oil (oil disposal raft) or serve as accommodation if vessels are undergoing a dockyard period (house boats). Additionally, the range of tasks includes inter alia sailing boats, cutter and motor launches used at Navy schools for training purposes.

The defence fleet comprises ships and boats of the defence engineering sector operated by WTD 71 and the Naval Arsenal. WTD 71 needs ship capacities with special capabilities in order to conduct defence research as well as studies and trials. In addition to the research vessel PLANET, the WTD has small and medium multi-purpose vessels as well as special vessels and support vessels at its disposal. Material maintenance of Navy units afloat in the Naval Arsenal is supported by a floating dock, a floating crane and some smaller units.

Currently, the focus of the S5 division is on in-service activities of all kinds. This includes comprehensive modernisation activities and measures to maintain the operational readiness of the Navy. In the medium term, new construction projects of naval units like support tankers, intelligence collectors or tenders will be looming on the horizon. ■

Sea Directorate – Glossary	
Project	**Responsible branch**
Class 124 frigate	S3.1
Class 125 frigate	S3.2
Class 130 corvette	S3.3
Data processing equipment for class F122/F123 combat direction system	S3.4
Class 212A submarines	S4.1
DM2A4 torpedo	S4.2
Antisubmarine weapon 90 (UAW 90)	S4.2
Underwater reconnaissance drone (AUV)	S4.2
Sonar 90 for surface ship	S4.3
Underwater detection system class 122/123 frigate	S4.3
Combat support ship	S5.1
Class 751 defence research and trial ship	S5.2
Radar navigation system ECDIS/AIS	S5.2

Land Support Directorate (U)

The spectrum of tasks of the Land Support Directorate (Directorate U) BAAINBw is very varied – it ranges from personal equipment to camps, medical equipment, CBRN protection, clothing, military wheeled vehicles, special vehicles and equipment to electronic warfare systems, reconnaissance, air traffic control, robotics as well as training and simulation.

Apart from that, the Land Support Directorate exercises the general functional supervision over the Bundeswehr Technical Center for Land-based Vehicle Systems, Engineer and General Field Technology (WTD 41) in Trier, the Bundeswehr Research Institute for Protective Technologies and CBRN Protection (WIS) in Munster and the Bundeswehr Research Institute for Materials, Explosives, Fuels, and Lubricants (WIWeB) in Erding.

The core tasks of the Land Support Directorate include: project management in accordance with the amended Customer Product Management (CPM (nov.)) during the entire life cycle of the materiel, systems technology and integration tasks, research and technology, in-service support as well as contract management and price negotiations.

Compared to other project management directorates the U Directorate covers an extraordinarily broad technical range of tasks, a very high number of projects which also include smaller ones and distinct procurement activities, particularly for Urgent Operational Requirements. The U Directorate is supported by the Directorate Staff and the Directorate Controlling.

The actual project work is done in the four Project Divisions of the Directorate. They are supported in their work by the two Divisions Economic and Technical Affairs (U1) and Economic and Legal Affairs (U2).

The Economic and Technical Affairs Division (U1) supports all projects and the executive level of the Directorate. They may also assume tasks for projects with independent and/or shared responsibilities.

The Economic and Legal Affairs Division (U2) with its six branches is in charge of contract management and price negotiations for the Project Divisions.

The variegated tasks in project work such as implementation, use or condemnation are reflected in the diverse projects of Divisions U3 to U6.

The tasks of Division U3 include camp technology, protection and logistic support, CBRN and medical equipment and clothing. U4 deals with protected wheeled vehicles, special vehicles and equipment,

Land-based casualty decontamination facility casualty transport system VTS

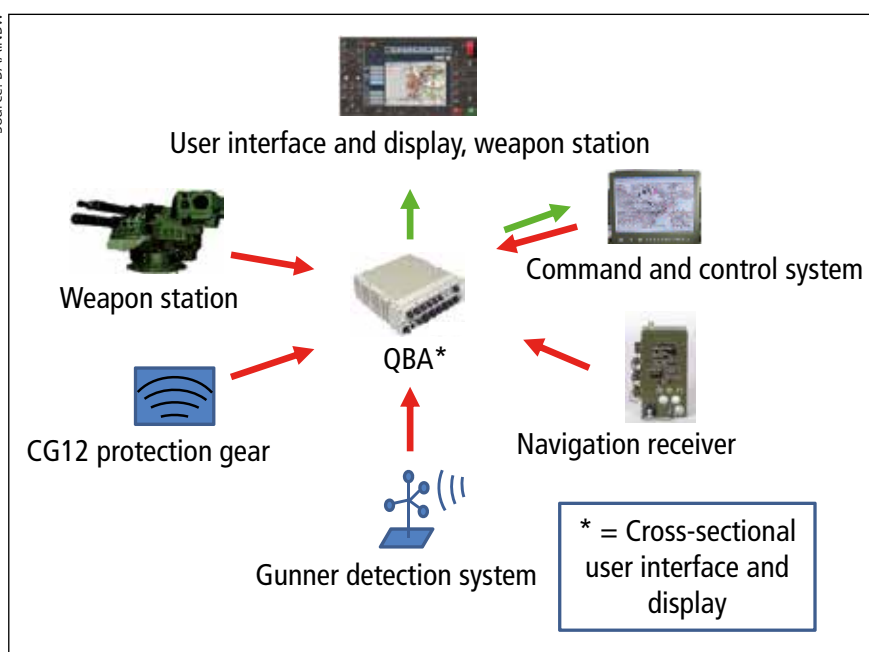*Land-based casualty decontamination facility wet decontamination module interior view*

integration, protection and is responsible for R&T activities.

Division U5 works on projects in the fields of electronic warfare, reconnaissance, air traffic control and identification as well as the system infantryman. Division U6 is responsible for training technology, simulation and robotics.

Setup of the cold weather test of the land-based decontamination facility in Oberjettenberg

User interface and display, weapon station

Weapon station

QBA*

CG12 protection gear

Command and control system

Navigation receiver

Gunner detection system

* = Cross-sectional user interface and display

Overview of systems to be included in the QBA concept

Several of the U Directorate's current projects are presented below to exemplify the directorate's work.

New Capabilities of the Bundeswehr Medical Service

At the end of July 2015 Branch U3.5 of BAA-INBw handed over the first series system of the land-based casualty decontamination facility to the medical training regiment in Feldkirchen. Thus, the Bundeswehr Joint Medical Service has a new capability in the field of CBRN medical defence.

Irrespective of the comprehensive global efforts to promote disarmament and arms control, the continued development and proliferation of nuclear, biological and chemical agents (CBRN agents) and the growing potential of dangerous industrial substances containing CBRN agents still present a major risk concerning the exposure to CBRN agents. In view of the probability of conflict prevention and crisis management operations – including the fight against international terrorism – and rescue and evacuation operations, the Bundeswehr has to prepare for the entire range of potential threats posed by attacks and exposure to CBRN agents and comparable natural or industrial hazards. This does not just imply the probability of attacks with CBRN agents on large areas but also the selective employment of these agents at a low level. It also holds true for the threat posed by international terrorism, hazards caused by technical shortcomings and resulting accidents and/or collateral damage in the vicinity of nuclear and chemical plants in possible areas of operation of the armed forces. The sources of danger are manifold and their danger potential is sometimes difficult to identify.

In this context the Bundeswehr Medical Service is responsible for restoring and maintaining the health of those exposed to CBRN agents. As these health impairments are specific and rare and require special knowledge and abilities with regard to prevention, diagnostics and treatment, medical CBRN protection must become an individual medi-

cal element, specifically tailored to this task. The military basis for medical operational support under CBRN conditions is the medical service's capability to protect personnel, patients, material, facilities and transport assets from CBRN exposure (all-arms CBRN defence). Medical support processes (such as the treatment and transport of patients) must be able to be continued in a contaminated operational area until such time as the danger caused by CBRN agents is over or the patients have been evacuated.

Casualties who have been exposed to CBRN agents can only be treated in medical facilities if personal CBRN protection is lifted. Therefore, a thorough decontamination in an appropriate casualty decontamination facility with adequate initial emergency medical treatment is required before the casualty exposed to CBRN agents can receive follow-on treatment in a Role 2 or higher medical facility.

The land-based casualty decontamination facility can operate on a stand-alone basis for up to one hour; it can only be employed sustainably if the special capabilities of the CBRN defence corps are available (such as decontamination of personnel and material, supply and disposal of consumables). The CBRN defence capability portfolio must therefore be integrated in the medical conception of this capability.

The operational capability of the land-based casualty decontamination system was demonstrated in the context of troop trials. Subsequently, cold-weather trials were conducted at the Bundeswehr Technical Center for Protective and Special Technologies (WTD 52) in Oberjettenberg in January 2015. The aim was to test the operation of the facility in wintry conditions and investigate the behaviour and suitability of those components of the wet decontamination module that contain water in rough climatic conditions.

The system of the land-based casualty decontamination facility offers the possibility to decontaminate and administer adequate emergency treatment to up to 20 walking casualties and up to six stretcher casualties an hour. Initial operational readiness and/or deployment readiness of the facility can be created within two hours. 15 soldiers are required for the setup of the system and 25 to operate it. Operational readiness per shift and day amounts to six hours.

Common Operation and Display Equipment for Protected Vehicles

Among other things, Branch U4.1 is responsible for the integration of systems in protected command and multi-purpose vehicles (GFF), protected transport vehicles

New IR-Targeting Sights Provide Optimal Protection and Precise Engagement

Sensors for early and remote detection as well as identification of threats at day, night and reduced visibility are key enablers for protection and effective engagement of our forces.

High resolution thermal sights are the gold standard as they do not need any illumination and they enable to identify persons and materials due to their own thermal emission.

Important Trends in the IR-Development:

Minimum Size Weight and Power (SWaP)

For the dismounted soldier reduction of size, weight and power (SWaP) is mandatory. Key is a new High Operating Temperature "HOT"-detector-chip-technology, providing outstanding performance at approx. 50° above typical operating temperatures (-200°C) at which standard IR-detectors are working. Specifically adapted cryocoolers achieve these at much lower cooling power of approx. <2W, providing superior performance of cooled IR-devices at power consumption next to uncooled. Using these technologies, the new AIM-WBG Hun-

AIM Thermal Sight HuntIR Mk2

High Definition

Higher resolution allows to reliably separate aggressors from non-combatants or to precisely identify individuals in asymmetric military missions, like an HDTV in the hand of the military leader or sniper. Such highly compact HD-"HOT-Cubes" using pixels as small as 10µm will be standard IR-detectors for thermal imagers soon.

Dual Color

While IR-detectors so far have been collecting all radiation in one specific spectral band, the so called 3rd Gen or "Dual-Color"-IR-detectors shall provide individual detection of 2 different spectral bands. This needs highly complex chips with 2 differently IR-sensitive layers in each pixel. Prototypes of such detectors are just becoming available in AIM's reliable industrial technology based on HgCdTe. Applications range from improved vision for a human observer by using case by case individual advantages of different spectral bands to improved machine vision for missile seekers or missile approach warners of e.g. airborne platforms by using specific spectral fingerprints of targets or obscurants.

"Night-Glow"-Imagers in the Shortwave IR

The German Bundeswehr is using a mix of thermal and I2 sights. I2 sights do not "see" the passive thermal radiation like a thermal sight but need some residual illumination, e.g. stray light or moonlight. These devices are very small and lightweight and they provide large fields of view together with a good spatial resolution. Helmet mounted, they offer the soldier a good visibility at close distances to move safely in the dark and to engage targets at short ranges.

Present missions often put the I2 technology to their limits. While in Central Europe stray light is always present e.g. from nearby cities, our troops in e.g. Afghanistan are often faced with entire darkness. This sudden and complete loss of vision presents a high risk.

In shortwave infrared (SWIR) at a wavelength of approx. 1.8µm, it never becomes entirely dark outside, because chemical reactions in the atmosphere provide some illumination, the so called "night or air glow" effect. This spectral range allows new types of I2 devices. By extending the spectral window up to >2.2µm even some faint thermal radiation is available to improve visibility. Such detectors can be operated at a very little cooling power providing minimum SWaP again. With some residual light present, the impression is similar to the visible range, which makes identification easier.

Gated Viewing to See Through Obscurants

Gated viewing technology is introduced to further improve identification performance. The scene is actively illuminated by a laser and only reflective light from a selectable time range (gate) will be collected in the detector. The selected time range corresponds to a range, which exclusively is displayed while any information outside is suppressed. This allows to see through smoke or other partially transparent optical disturbances. The SWIR spectral range allows the use of eye safe laser at a wavelength of 1.5µm.

AIM is presently developing demonstrators of a SWIR targeting sight and a SWIR gated-viewing-device.

SWIR-Picture, person with car, new moon, nearly cloudless sky

Pictures: AIM

tIR Mk2 is to be fielded for the German Bundeswehr to cover requirements for thermal targeting sights with medium to long range performance in most compact, lightweight and energy efficient way. The sight is also qualified as targeting sight for support weapons like the heavy .50 machine gun.

Picture of QBA with the many required connections in order to cover the varied data formats of the subsystems

(GFT), and protected special-purpose vehicles (GSF). New information systems, reconnaissance systems and protection and weapon systems will increasingly be used in these protected vehicles. Many of these vehicle subsystems have their own operation and display equipment and are assigned to individual operators due to their respective specific functions. On the other hand, space is limited and visibility for the military driver and the active passenger in the vehicle safety cell is reduced. The passenger proactively supports the driver in order to compensate for the reduced view from the protected vehicle and thus improve the overall view of the road. The active passenger's field of view must not be additionally obstructed by components of the command equipment or weapon station (in accordance with requirements issued by the Central Office for Military Motor Vehicle Affairs). However, this person is also the commander and operates the above-mentioned individual vehicle subsystems with their many pieces of corresponding operation and display equipment. As a consequence the number of different pieces of operation and display equipment should be reduced and the functions required from the military user's point of view should be concentrated on few ideally common pieces of operation and display equipment. This problem was investigated in the study "Common Operation and Display Equipment (QBA) for Protected Vehicles" and a project was initiated based on the results of the study.

Common operation and display equipment facilitates limiting the handling of many different vehicle subsystems to a single operation and display equipment and provides the relevant information to the operator in a processed mode.

If a vehicle subsystem or its connection fails, the user will be informed immediately. This application is an important component of the constant monitoring of all functions as it gives all crew members a complete overview of the operational readiness of the system. If the connection to individual vehicle subsystems is interrupted, the function of these subsystems remains intact independent of the common operation and display equipment. Further and future vehicle subsystems can be integrated with little effort.

The unrestricted functioning of the following vehicle subsystems with common operation and display equipment has already been tested and demonstrated: FLW 100/200 (remote-controlled light weapon station), rear view camera, command and control equipment (consisting of monitor, keyboard, communications server and laptop Rocky III+, sniper detection system (SDA) and the navigation receiver ERGR (Explosive Resistant GPS Receiver)).

according to the system architecture: the military driver, the commander and the operator of the remote-controlled light weapon station. The commander operates the command and control equipment and other equipment. Using the common operation and display equipment the commander can also display the current field of view of the FLW. Therefore the commander has the same information as the FLW operator and thus an optimised operational picture.

The common operating and display equipment (QBA) represents a future-proof system which can meet the many challenges of different data formats and interfaces of the vehicle subsystems without changes to the existing equipment and it can therefore make the operation of the vehicle subsystems in protected Bundeswehr vehicles much easier.

The ARED Project

Until the beginning of the ARED (Air Surveillance Radar System for the Tactical Air Command and Control Service) project the German Air Force had three generations of radar systems. The oldest radar system was the Medium Power Radar (MPR) from the 1960s. The first four phased array radars have been procured with the Hughes Air Defense Radar (HADR) sensors. The youngest generation, the RRP 117 (Re-

Sensors used by the Tactical Air Command and Control Service

Based on real applications, two system architectures were designed for the vehicle classes protected transport vehicle (GTF) and protected multi-purpose vehicle (GFF). The crew of the GFF class vehicles for instance, consists of at least three persons

mote Radar Post), uses semiconductors instead of a central amplifier tube to generate power.

The operation of the MPR system became uneconomical after a time because obsolescences had to be remedied more and

Photos: Bundeswehr

The MPR in Auenhausen being disassembled

GM 406 during the installation in Auenhausen with the MPR antenna in the foreground

more often. In addition to that, the systems were not designed for partially unmanned operation which must be considered to be the foundation of the implementation of the air force's structural decisions.

In 2008, the required replacement of MPR was recognized as a capability gap. About two years later, on 16 December 2010, the contract on the procurement of six Groundmaster 406 (GM 406) long-range radar systems which are available on the market was signed with the French company Thales Raytheon Systems (TRS). The two main components of the ARED system are the primary radar by TRS and the secondary radar MSSR 2000 I by Airbus Defence and Space (ADS). They are integrated at TRS in Limours (France).

The design of GM 406 primary radar differs fundamentally from the design of older radar systems. Power consumption is significantly lower and the signal is generated and transmitted exclusively digitally. The GM 406 uses digital beam forming to achieve the highest possible detection performance. Digital signal processing on the receiving path leads to excellent detection quality. For the secondary radar, the ARED project used common technology already fielded in the Bundeswehr: thus, the sec-

ondary radar interrogator MSSR 2000 I by ADS, which is already used by the Tactical Air Command and Control Service, local military air control services and the Navy, is also used for ARED.

In the course of the ARED project the first MPR was deactivated in Auenhausen in autumn 2011. In parallel to the adaptation of the infrastructure and the preparation of the old MPR building the factory acceptance test of the radar system took place in Limours in summer 2012. The system acceptance tests (SAT) of the first new system were successfully concluded in April 2013 whereupon ARED was immediately handed over to the Luftwaffe for operational testing. The remaining five systems were also handed over to the user for operational use within the planned time and cost schedules in 2014 and 2015. ■

Land Support Directorate – Glossary	
Project	**managed by**
Billeting and Mission Support, Camp Technology	U3.1
Modular Camp, Air Transportable	U3.1
Modular Medical Facilities	U3.1
Protection of Objects and Facilities, Security Technology	U3.2
Commant Posts, Tents	U3.2
Power Supply and Air Conditioning Technology	U3.3
Test Equipment and Electronic Components, Lighting Engineering	U3.3
Power Management, Power Generation and Power Distribution in Operations	U3.3
Military Pharmacy, Military Medical Research, Laboratory Systems	U3.5
Medical Facilities and Equipment	U3.5
CBRN Protection Systems	U3.6
CBRN Reconnaissance Systems	U3.6
Decontamination Equipment	U3.6
Clothing and Personal Equipment	U3.8
Combat Clothing and Battle Clothing	U3.8
Protective and Special Clothing	U3.8
Integration, Protection, R&T Activities	U4.1
Protected Multi-Purpose Vehicles, Classes 1-4	U4.2
Protected Light and Medium Cargo Vehicles	U4.2
Protected Transport Vehicles (GTF) and Protected Special-Purpose Vehicles	U4.3
Container ISO 20 foot, Protected, Personnel	U4.3
Unprotected Transport Vehicles and Unprotected Special-Purpose Vehicles	U4.3
Recovery and Handling Vehicles, Engineer Work Equipment, Special Service Equipment	U4.4
Protected Recovery and Crane Vehicle	U4.4
Protected Recovery and Towing Vehicle	U4.4
Fuel Delivery Vehicles, Mobile Tank Systems	U4.5
Firefighting Vehicles	U4.5
Electronic Warfare	U5.1
Communications/Electronic/Electronic Support Sensors, Sensor-Specific Evaluation	U5.1
Communicatons Intelligence Systems	U5.1
Electronic Warfare, Central and Common Assessment	U5.2
Tactical Command and Control Service, IFF, Ground-Based Radar Reconnaissance	U5.3
Radar Identification System Interrogation/Mode S Data Network	U5.3
Mode 5 Transponder	U5.3
Air Traffic Control	U5.4
Aerodrome Surveillance Radar Series Configuration (ASR-S)	U5.4
Optics and Optronics for Ground-Based Recconnaissance	U5.5
Thermal Observation Devices and Thermal Sights	U5.5
Combat Equipment for the Infantry Soldier System	U5.5
Media Technology, Geo Information Affairs	U5.6
Training Assets, Training Technology	U6.1
Live Simulation, Design Simulation and Robotics	U6.2
Virtual Simulation	U6.3

Information Technology Directorate (I)

Information technology (IT) continues to advance at a very high speed, with a direct effect on Bundeswehr capabilities. There are increasing possibilities for the use of state-of-the-art IT on the battlefield, just as expectations are constantly rising, as well. The Information Technology Directorate's task is the implementation of armaments projects – but it is not a directorate like any other.

The I Directorate manages the mission- and C2-related information technology projects. This includes everything from commercial servers to specially developed software and complete command post equipment and signal teams. But also communication systems (such as radio sets) and even their own communications satellites are part of the directorate's product portfolio. This requires a wide variety of technical capabilities such as informatics, communications engineering, vehicle construction, air-conditioning engineering and logistics, to name but a few. Just like all armaments projects, these projects are managed within the scope of the Integrated Planning Process (IPP) and the CPM (amended) procurement process. These are, basically, the challenges that all project directorates of the BAAINBw are facing. What exactly does make the I Directorate so special?

The individual IT projects have to be coordinated in such a way that they eventually form one overall Bundeswehr IT system. This means that in the end everything has to be connected with everything else. Everything has to fit together in terms of time and content, e.g. connectors, communication protocols and data formats. Since most Bundeswehr operations take place in an international context, it is also necessary to consider gateways to other nations or NATO right from the start. The IT procured by the I Directorate is not only used at command posts but due to the ever increasing networking has also become an integral part of tanks, ships and aircraft.

As the I Directorate uses its products to promote the networking of the weapon systems, it is also jokingly called the "spider in the web". Multi-project coordination, or "programme management", therefore plays a major role, especially with regard to IT projects that depend in many ways on other projects. In this connection, the harmonisation of the various IT projects as well as the coordination with the other armaments projects are of the utmost importance. This is the case, for instance, when radio sets are to be installed into vehicles. It is in line with these ideas that the I Directorate, while striving to increase efficiency, progressed within the frame of the "I2.0" working concept. But what does this mean in concrete terms?

The Bundeswehr satellite communications project (SATCOMBw) is also managed by the I Directorate. SATCOMBw has become an indispensable part of Bundeswehr operations. The picture on the right shows the 4.6m ground station antenna on the roof of a building at Camp Qasaba, Kabul

Source: BAAINBw
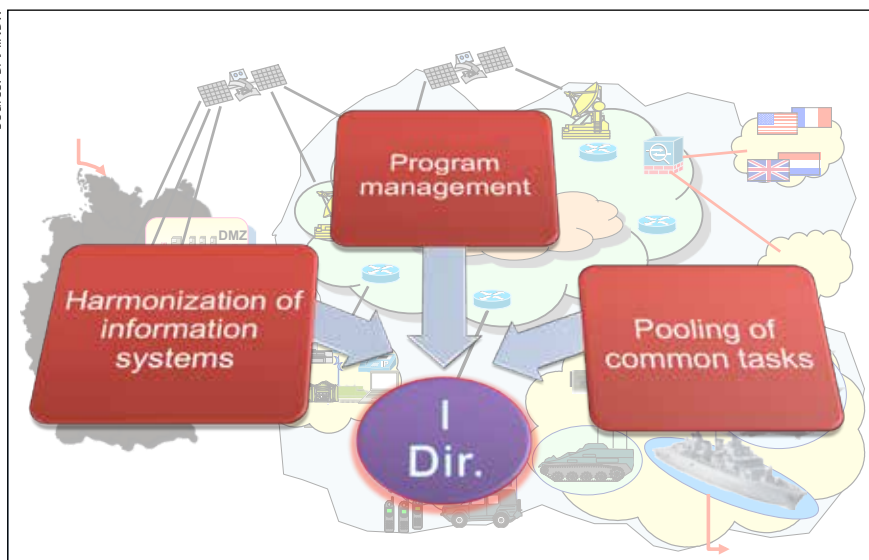
Improving management across projects and increasing efficiency are the core elements of the restructuring of the I Directorate within the frame of the "I2.0" working concept

Photo Bundeswehr

BITS administrators are becoming acquainted with Stationary HaFIS

Gaining Efficiency by Pooling Common Tasks

To date, issues that affected all projects have been dealt with by individual project managing branches. This referred to issues related to one another from the fields of logistics, technical documentation and SAP implementation. Individual project managing branches had taken over these tasks, which have to be carried out by specially qualified personnel, at short notice and so far as their current personnel situation permitted. Given the unavoidable personnel turnover, it was quite difficult and costly to maintain the specific expertise required for each common task, while the branch's

first priority was to have enough personnel for the management of its projects. This is why the common tasks were consolidated in the directorate.

Programme Management – Everything Has to Fit Together

Since 2012, the I Directorate has had very positive experience with the programme management within the division responsible for the harmonisation of the command and control information systems. Metaphorically speaking, just like an architect who prepares a plan which is then used to build the house, the directorate's IT experts

prepare a plan for the implementation of the command and control information systems, using the Architecture Method. They also make concrete suggestions to the project managers regarding technical solutions which should be pursued from an overall planning perspective. The I Directorate expanded this successful programme management so that it comprises all information and communication systems for which the directorate is responsible. Embedding IT into the Bundeswehr's overall equipment system supports the directorate's programme management by means of close cooperation with the superior system architects of the P Directorate.

HaFIS1 for Everyone

In addition to the considerations as to which tasks should be dealt with on a common basis and how management across projects can be implemented, a question which constantly arises is: How can the actual technology be made even more efficient? Are there any principles that can be applied to all projects?

IT can be implemented and operated much more efficiently if the technology is standardised. The important keywords here are "uniform standards" and "service orientation". Regarding the command and control information systems, the new and promising approach that has been taken is called "Harmonization of the Command and Control Information Systems (HaFIS)". It can already be mentioned at this point that HaFIS serves as a guiding principle for all projects subsumed under this technical standardisation. This helps to improve both efficiency and interoperability of the information systems.

### It Is the Success of Everyone Involved that Counts

Regarding management across projects, the I Directorate has already gained experience and achieved good results in some specific areas. By means of "I2.0", it was built upon these achievements and the tried and tested methods were further expanded. At the end of the day, true success can only be seen in the interaction of all projects.

How are the projects of the I Directorate progressing in specific terms?

Stationary HaFIS – Handover to the Operator

The various command and control information systems, which also differ with respect to their technical implementation, are to be

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1 Harmonization of the command and control information systems

Source: BAAINBw
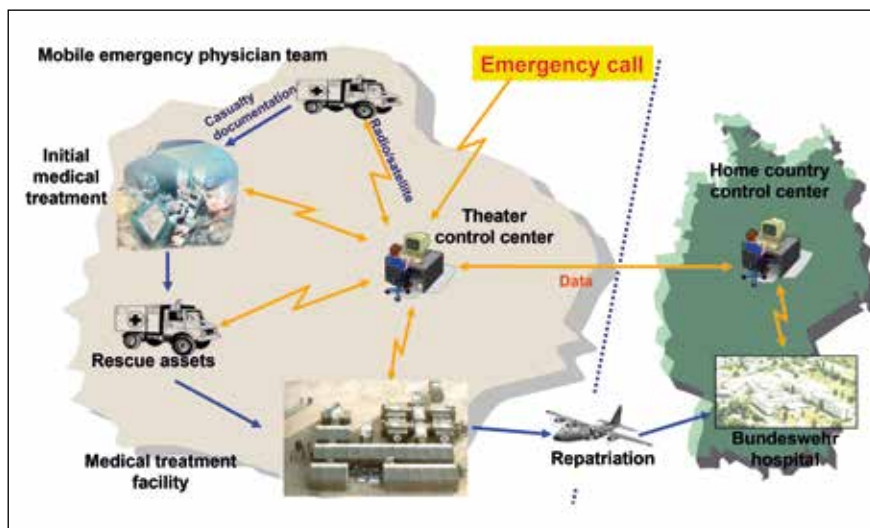
Medical evacuation chain

harmonised by means of technical standardization. This will simplify both implementation of the systems and user training and operation of the systems.

HaFIS is intended to enable users to have access to a common information environment using the same procedures and tools. It has to be noted in this context that the data are subject to different secrecy requirements and have to be safeguarded accordingly.

Harmonisation will be accomplished in four migration steps. First of all, the data centre technology which is permanently installed inside facilities will be migrated to Stationary HaFIS (Harmonisation of the stationary C2I system components). To reduce susceptibility, the HaFIS data centre is currently distributed to two locations, including backup equipment.

As a very first step, state-of-the-art technology enables secure and high-perfor-

mance support of email and office applications. This is complemented by an electronic registry and other features such as applications for the provision of geographical information.

Worth highlighting is the fact that this system is even secure enough to process information requiring special protection. In this respect, it differs considerably from the normal Bundeswehr office workstation IT equipment.

Standardising technology also affects operation and its support. In the end, also the operator, i.e. the Bundeswehr Communication and Information Systems Services Center (BITS), will benefit from this development. It will, for instance, no longer be necessary to have fundamental knowledge of many different systems. But initially, this migration presents a challenge, since the processes required to operate the modern platform have to be established. For the transitional period, legacy systems and Stationary HaFIS have to be maintained in parallel.

Stationary HaFIS is now undergoing intensive performance testing and is being put into operation by BITS step by step.

To start with, it is planned to give users from the Multinational Joint Headquarters Ulm access to the initial functions (email, office, registry, etc.). More users, e.g. from

the Bundeswehr Operations Command, will be added.

As soon as the Bundeswehr Operations Command is added, the first specialised application that is used on one of the various predecessor systems, will be made available: the Operational Reports and Returns System. It is of great importance for the Bundeswehr Operations Command, as it is designed for a fast and targeted exchange of military messages.

The second of the four migration steps is called Deployable HaFIS. In order to be able to set up the HaFIS data centre technology in the theatre of operations, the same technology is planned to be installed in transportable containers, as well. These modules can then be used to build a small data centre on site. The implementation of Deployable HaFIS has already been started; the in-service use is planned to start in 2018.

The last two migration steps will focus on C2-relevant information processing in vehicles and airplanes ("Mobile HaFIS") and ships ("Seagoing HaFIS"). Stationary HaFIS will always provide the foundation of all further migration steps.

SAFES2 – Saving Lives with IT

Another example comes from the field of command, control, information (C2I), and weapons control systems. C2I and weapons control systems are IT systems tailored to the specific requirements of specific users and their weapon systems.

An example may serve for illustration: A C2I and weapons control system includes a computer which is installed inside a tank. This computer has been hardened especially for its use in the tank. The computer supports the crew e.g. by displaying a map which shows other friendly and enemy troops. Upon selection of a target on the computer, the target data are transmitted to the tank's weapon so that the target can be engaged. It is also possible to exchange situation reports with other units. The data are transmitted by military radio.

One of these systems is the Medical Command, Control, and Communications System (SAFES). Soldiers on operations can

2 Medical command, control, and communications system

Photo: WTD 81

SVFuA equipment in the 2 line configuration

rightly expect high-quality medical care. In emergencies, every second can make the difference between life and death. While this is also true back home, the prevailing conditions in the theatre of operations are much more difficult. How, then, can IT help? The shorter the period between injury and initial medical treatment and the more precisely and early the medical information about the injured person is made available to the attending physicians, the higher are the chances of survival and cure.

SAFES aims to minimise this crucial time period. For this purpose, the "medical situation" has to indicate the location where the patient concerned can be treated. Subsequently, the patient can be transported to a medical treatment facility in the country of deployment or even to a Bundeswehr hospital in Germany. There, the physicians can immediately start working, because thanks to SAFES they already have the necessary information about the patient.

SAFES equips the following elements:

- Patient evacuation coordination cells for central coordination of rescue assets and treatment facilities,
- Rescue assets, i.e. medical rescue forces with land, sea and air rescue and transport vehicles,
- Stationary or deployable treatment facilities (e.g. rescue station or air-transportable surgical hospital) for casualty care and
- Medical command and control cells (e.g. command post medical cell) as a link between medical and combat units.

The central element of the system is the application software. It was developed as a software extension to the Army command and control information system. This gives medical forces all functions of the Army C2I system (including, for example, situation display and reporting system) in addition to the specific medical functions.

Software as well as hardened hardware equipment was procured and integrated into protected medical vehicles, combat posts and classrooms.

A special feature of this system is a memory stick which not only stores the emergency medical data but also the patient-related electronic casualty documentation. This memory stick accompanies the patient all the way from initial medical treatment via the field hospital to the hospital in the home country. In this way, all relevant patient data are available at any time so that the patient can receive the best possible treatment. In June 2015, the system was handed over to the user.

How then are the harmonisation of the command and control information systems (HaFIS) and SAFES connected? At present, SAFES is implemented as a functional extension of the Army C2I system currently in service use. As HaFIS is further developed, the Army C2I system and SAFES are planned to be covered by the harmonisation process and migrate to the modern platform.

SVFuA3 – Coming Soon

The best application is useless when the computer is offline. In everyday life, most of us are constantly online with our computer, tablet or smart phone. Under the heading of "network enabled operations", this development has also found its way into the armed forces. Tanks, ships and aircraft, even the infantryman, have to go online first in order to be able to access this profitable command and control system. Voice and data, e.g. positional data or video data recorded by helmet cameras, are to be transmitted simultaneously.

In the military environment, expectations are particularly high with regard to the network connection which has to be independent of third-party on-site infrastructure. This already rules out the option to use smart phones. The connection must neither be

3 Joint networkable radio equipment

disrupted nor intercepted. In summary: A "hardened" solution is required.

Most of the Bundeswehr radios, some of which have been in use for decades, do not fulfil these requirements. Moreover, they only cover small fields of application so that often several radio sets have to be installed in one vehicle. These radios require space and much energy, which is both scarce in a vehicle.

Possible solutions are software-based radios. They are programmable to assume the function of several conventional radios. They can also operate several links (radio lines) simultaneously. In addition, such radio sets enable high-speed data transmission. As early as in 2007, the Bundeswehr decided to invest in the development of software-based radios within the scope of the "Joint networkable radio equipment" project. This decision was made on the basis of the Bundeswehr's own basic research results. Everybody involved knew, however, that there was still a long and difficult way to go. Many technical problems related both to radio engineering and IT security had to be solved before the radio equipment could be provided.

Several companies were involved in the development of the basic unit, the software and additional modules. Antennas and transmitter/receiver modules, for instance, have to be designed differently for different ranges.

Today, the development has almost reached its successful completion. Tests and acceptance inspections were performed to verify the secure parallel voice and data transmission as well as video transmission. Also the system's mechanical suitability for severe military routine operations had to be demonstrated. The units had to endure, for example, heavy vibrations, shocks or a gush of water.

It also has to be clarified how exactly the radio equipment can be installed in the Bundeswehr vehicles. For this purpose, the equipment is installed in vehicles such as PUMA, BOXER, FENNEK, DINGO 2 and ENOK and then inspected.

SVFuA provides the Bundeswehr with radio equipment which is unique even at international level. Its development was very demanding, not only in technical terms. Project management, too, was particularly challenging for the Bundeswehr: They were responsible for all individual contractors, as there was no main contractor in charge of coordinating these companies – a task which the team mastered extremely well. It paid off that the Bundeswehr had started to build up technical know-how through early research and technology efforts. Preliminarily, command vehicles are to be equipped with SVFuA within the frame of a first lot that is being prepared at the moment.

High-Quality Training in the Information Technology Competence Centers (ITCC)

It has been suggested in the presentation of the previous projects that both the IT specialist and administrative personnel and the users have to be appropriately qualified. Regarding IT training, the I Directorate manages a project with a quite innovative approach even though it has been running successfully for twelve years.

The Information Technology Competence Centers (ITCC) are a Bundeswehr training project implemented in close cooperation with industry. Its aim is to provide IT training in a flexible and economic manner in line with industry standards. Established in Koblenz and Dresden, the ITCC project offers its participants attractive locations. Since 2002, the ITCC project has – for the fourth time now – managed framework contracts for basic, advanced and follow-on training programmes.

Training courses on many different commercial IT products are held at Dresden and Koblenz as part of the advanced and follow-

Photo: Bundeswehr

ITCC training courses in line with industry standards at attractive locations

on training programme for IT specialist and administrative personnel. The competence centres offer more than 100 types of training courses from a variety of fields such as network technology, user support or programming.

ITCC training courses are also held at the Bundeswehr Communication and Information Systems School in Lagerlechfeld. Those courses are part of the specialist military training (e.g. PC and network technology, programming, transmission technology).

In addition, the ITCCs offer training courses for all users of office application software from the area of responsibility of the German FMOD.

The ITCC control team of BAAINBw Branch I1.3 is in charge of the course management and course allocation. This includes not only the preparation of the annual training catalogue, the course calendar and the maintenance of a training course database, but also quality assurance of all IT training courses conducted.

With ITCC management, the I Directorate makes an important contribution to the Bundeswehr personnel being able to use IT in a beneficial way.

Looking Towards the Future – Fascinating Projects Are Making Good Progress

Every project division is looking forward to new projects. The I Directorate currently provides expert support to the preparation of two very important projects.

The first project deals with the modernisation of radio sets for mobile tactical communication ("MoTaKo"). For this purpose, basically the total amount of radio sets on the battlefield has to be taken into consideration. This includes portable radios, but also radio sets installed in vehicles and cockpits. The existing radios have become obsolete; most of them are no longer suitable for network use in the age of internet technology. Mobile tactical communication involves one billion worth of investments. In the course of the preparations for MoTaKo, the specific applications for the in-house developed high-quality SVFuA radio sets are defined. For simple applications, commercial software-based radios may, in some cases, be more economical than SVFuA. Satellite radios enabling high-speed connections on the move are also part of the portfolio.

Depending on the sensitivity of the information to be transmitted, they have to be encrypted accordingly. Modern encryption equipment has to enable high-speed data transmission and be interoperable with state-of-the-art network technology. The "crypto modernisation" project focuses on the modernisation of encryption devices.

Both projects – MoTaKo and crypto modernisation – contribute considerably to the modernisation of the Bundeswehr operational network and to an enormous increase in performance, especially on the battlefield. For the I Directorate, these two projects, which comprise a wide range of radio sets and encryption devices, represent a major challenge. Not only will they involve large investments, the legacy systems also have to be kept operational in parallel over several years.

What about "Captain CIRK?"

Federal Minister of Defense, Dr. Ursula von der Leyen, has responded to the challenges in cyberspace by announcing that the existing cyber and IT capabilities distributed throughout the Bundeswehr are to be pooled. To this end, a new organisational element, "Cyber and Information Space", comprising a Cyber and Information Space Command (CIRK) is planned to be established. The I Directorate has already been able to contribute its expertise to the planning work for the new major organisational element. This also includes the positive experience gained from the close cooperation with the BAAINBw project divisions which manage the weapon systems (ships, tanks, aircraft, etc.). Because what counts in the end is that the weapon systems and IT function together in one equipment system. Here, too, it is the success of all involved which counts.   ■

Information Technology Directorate – Glossary

Project	Branch responsible
Information Technology Competence Centers (ITCC)	I1.3
ELCRODAT 5-4 Crypto Phone Equipment	I3.2
Bundeswehr Mobile Communications System (MobKommSysBw)	I4.2
Short-range Terrestrial Transmission System (TÜtrSys)	I4.2
Participant Network, deployable	I4.2
Army Command and Control Information System (ACCIS/FüInfoSysH)	I4.3
ACCIS/FüInfoSysH – Lot 1 – Product Improvement	I4.3
Harmonized Command and Control Information System (HaFIS), stationary	I4.4
Air Force Command and Control Information System – IT Equipment Expansion	I4.4
Air Force Command and Control Information System – Product Improvement (PV FüInfoSysLw)	I4.4
Joint Command and Control Information System – IT Equipment Expansion – Configuration Level 1	I4.4
JASMIN (Joint Analysis System Military Intelligence) Authorization Functionality	I4.4
Harmonized Command and Control Information System (HaFIS), deployable	I4.5
Joint Command and Control Information System (FüInfoSysSK) – Configuration Level 2	I4.5
Multinational Joint Headquarters IT Equipment (ITA MN KdoOpFü)	I4.5
Air Component Command Headquarters/Air Operations Center Basic Capability Development (ACC HQ/AOC AB GB)	I4.5
German-Netherlands Corps IT Equipment (ITA GNC)	I4.5
Military Intelligence Data Station Data Processing Equipment Phase IIb	I4.6
Systems for Computer Network Operations (CNO)	I4.6
Artillery Data, Situation and Operation Computer Network (ADLER), Artillery Systems Cooperation Activities (ASCA)	I5.1
Data Processing Equipment of the Medical Service Command and Control System	I5.1
Army Air Defense Surveillance and Command and Control System – Implementation Phase 1 (FüWES HERGIS)	I5.1
Branch-/Task-specific Command, Control, Information and Weapons Control Systems/Command, Control and Employment Systems for Land-based Operations (FüW(E)S-LBO)	I5.1
ACCS-ARS National Expansion and SMF (Software Maintenance Facility)	I5.2
Air Command and Control System (FüSysLuSK/ACCS)	I5.2
Air Operations Center – Air Command and Control System – GERMAN IMPROVED AIR DEFENSE SYSTEM (GefStd FüSysLuSK GIADS) – stationary	I5.2
Naval Command and Control Information System Product Improvement (PV FüInfoSysM)	I5.3
Combat Forces Integrated Command, Control, Information, and Weapons Control System (IFIS), Initial Equipment	I5.4
SATURN Ground-to-Air VHF/UHF Radio Transceiver (Second Generation Anti-Jam Tactical UHF Radio for NATO) – stationary	I6.1
HRM 7000/7400 Radio Series	I6.1
Naval Adaptive High Frequency Radio for Boats	I6.1
MIDS Radio Data Transmission System (Multifunctional Information Distribution System)	I6.2
Bundeswehr Satellite Communications System – long-term solution	I6.3
Participation in the "Heinrich Hertz" Satellite Mission	I6.3
Mobile Tactical Communication (MoTaKo) Programme Management	I6.4
Joint Networkable Radio Equipment (SVFuA)	I6.4
Interdisciplinary Component of the Bundeswehr Communication Server (QUAKS Bw)	I6.4
VHF/UHF Combat Net Radio	I6.5
Emergency Radio Systems	I6.5

"IT Support" Directorate (G)

Information Technology (IT) as a strategically important resource supports all command and control and business processes of the Bundeswehr and represents an important factor for its capabilities and future viability. The corresponding objectives are specified in the FMOD's "Armaments Agenda" and IT strategy. As part of the attractiveness enhancement programme "An active and attractive alternative", special emphasis is placed on the modernisation of the IT environment and user satisfaction in addition to the mere provision of IT services. The IT Support Directorate (G Directorate) of the Federal Office of Bundeswehr Equipment, Information Technology and In-Service Support (BAAINBw) is responsible for operating, implementing and further developing IT applications and systems throughout the Bundeswehr in order to support logistic and administrative processes. This includes compliance with the relevant phases of the CPM (amended) as well as the complete service life cycle in accordance with the IT Infrastructure Library (ITIL®1). In order to ensure a better harmonisation of these processes, the preliminary outline concept "Customer Center of Expertise (CCOE) SASPF2/Systems in Use (SinN)3" has been implemented. The G Directorate is the core of this CCoE and controls the required service management processes.

Background

Apart from the HERKULES project, SASPF is the Bundeswehr's key IT project. Even today, approx. 56,000 users are working with this highly integrative system that basically consists of the SAP standard software and selected complementary products. The Bundeswehr is one of the largest users of the SAP product suite – not only in Germany but worldwide.

The consolidation of responsibilities for the implementation and support of SASPF as well as the technical integration of SASPF and SinN into CCoE allows us to pool system know-how and use synergy effects. The G Directorate's "end-to-end" responsibility4 extends the responsibility to the entire life cycles of IT products and services and thus optimises their integration into the Bundeswehr IT system. Increasing economic efficiency and reducing the system complexity are important objectives that will be achieved by replacing more Systems in Use by SASPF and a consistent orientation towards the SAP standard.

In accordance with best practice recommendations, the quality of the implemented solutions is ensured through defined quality gates and a consistent application life cycle management. In operation, an IT Service Management that is oriented towards the specific requirements of SASPF/SinN gathers user feedback also from Bundeswehr operations abroad. These lessons learned are then considered in the deployment of new products as well as in the further development and adaptation of services.

Organisation and Bodies of the IT Support Directorate

The tasks of the Directorate are performed by five divisions and specific management bodies.

Division G1 "Economic and Technical Affairs" is responsible for developing concepts and plans for the logistical and administrative IT support including architecture. Among other things, it performs demand management tasks and is responsible for providing the necessary technology and common overlapping services that are required for operating applications. Division G1 is the central interface to the main process managers, the Introduction and In-Service Organisations, the external service providers, the HERKULES special organization and other BAAINBw directorates.

Division G2 "Economic and Legal Affairs" is responsible for the contract management of all contracts awarded by the G Directorate.
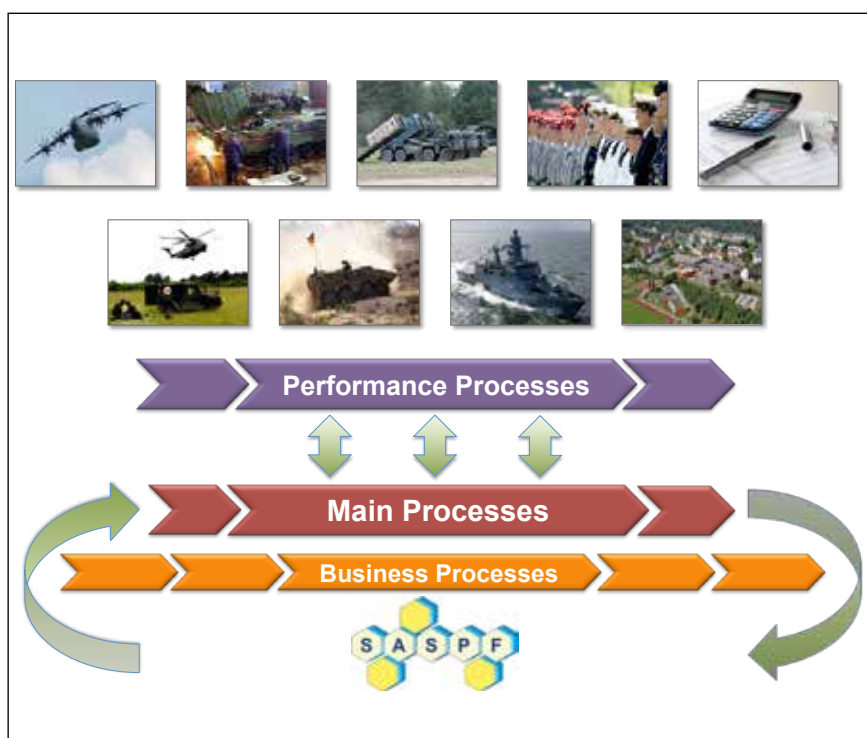
SASPF: A Highly Integrative System

Source: BAAINBw

The divisions "Processes – Personnel/Organisation/Individual Training" (G3), "Processes – Armaments/Logistics/Infrastructure/Environmental Protection" (G4) and "Processes – Bundeswehr Planning, Financial & Management Accounting, Controlling, Health Care, Special Areas" (G5) are process-oriented divisions. The branches of these divisions evaluate the requirements of the relevant main processes and business processes in cooperation with the competent main process managers, develop IT solutions, implement and roll out applications, and ensure their operational readiness including user support. This includes the identification of all allocated SAP modules, complementary products and Systems in Use as well as relevant interfaces.

The complex tasks associated with controlling and exercising the overall responsibility are performed by inter-organisational bodies at the Bundeswehr's SASPF/SinN Customer Centre of Expertise.

- The CCoE Board informs and involves the relevant agencies and makes strategic decisions.
- The main tasks of the IT Service Management Board are the design, implementation and updating of the IT Service Management model.
- The Demand Management Board collects, harmonises and prioritises user requirements, selects solutions and maintains the service catalogue.
- Change requests from Demand Management are prioritised and approved by the Change Control Board.
- The Architecture Board prepares guidelines and standards for the SASPF/SinN application and system architecture.
- The Data Governance Board was established to coordinate and further develop requirements for the quality assurance of master data.

Implementation of CCoE Processes

After the preliminary SASPF/SinN CCoE outline concept has become effective, the processes defined in this concept will now be implemented in all organisational areas and tested in practice. The G Directorate will be at the centre of the setup organisation and provide the head of the CCoE. The augmentation for routine duty will be performed in four successive waves:

- 1st wave: incident, problem and knowledge management;
- 2nd wave: demand, change and release management and resources planning;
- 3rd wave: capacity and configuration management;
- 4th wave: training and service level management.

Just like the performance, main and business processes, the respective IT service management processes were broken down to work step level. The interfaces to the main processes "Armaments" (due to interaction among project management and operation), "Accounting" (with regard to resources planning), and "Individual Training" (due to the transfer of initial training to regular training) are particularly important. This will create a comprehensive and transparent IT Service Management model that is tailored to the specific requirements of the Bundeswehr. The lessons learned during the test period will provide an essential contribution to the standardisation of IT Service Management within the Bundeswehr IT system.

Excerpt from the Service Portfolio of the G Directorate in 2015

The activities described below will provide an insight into the portfolio of BAAINBw's G Directorate. In addition to over 170 Systems in Use, more than 100 SAP modules and approx. 30 current projects, day-to-day work is focused on in-service management tasks ranging from mission logistics to assessments to payroll accounting for more than 100,000 users.
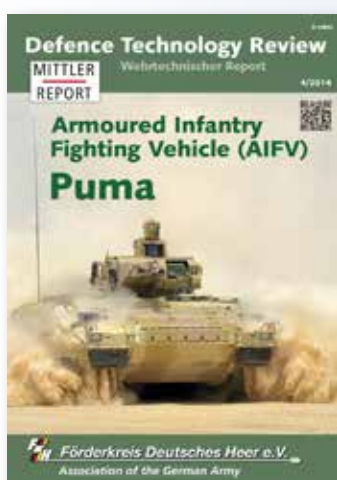
Photo: BAAINBw

Mobile shelter for SASPF applications with server and up to 15 notebooks

IT Operation: As part of ensuring a smooth IT operation, about 6,000 incidents and 1,000 problems were processed and about 1,500 changes were implemented in 2015. Even though the types and scopes of the relevant tickets and solutions are, of course, very different, they already indicate the size and complexity of the supported IT system.

Implementation of SASPF: With the introduction of the SAP Analysis for Office edition, the training for preparing controlling reports was placed on a new technological basis. In the field of personnel management, IT applications for the management of reservists and for the support of personnel conferences were implemented and the migration of the associated personnel data to SASPF was completed. Now payments in accordance with the Conscripts and Dependents Maintenance Act5 and military salaries can be managed using SASPF.

Complementary Products: The IT support for the Continuous Improvement Programme (KVP) was fundamentally modernised and adapted to the new framework conditions. The re-design of the joint planning tool for military training areas (IMEX SK) was successfully completed; this did not only improve user friendliness but also reduced the variety of employed software products and the number of required servers. In August 2015, the in-service responsibility for the Bundeswehr Travel Management System (SMS Stiewi) was re-transferred to BAAINBw.

SASPF Roll-out and Training of First Users: The introduction of SASPF in all Bundeswehr agencies made further progress in 2015. In the area of airborne weapon systems the focus of work is currently on the roll-out of SASPF in the EUROFIGHTER units.

In addition, the SASPF roll-out was completed in the Bundeswehr hospitals in Hamburg and Westerstede including several institutes of the Bundeswehr Medical Service as well as in three Bundeswehr pharmacies. The SASPF roll-out in the Bundeswehr Central Hospital in Koblenz and the four remaining Bundeswehr hospital pharmacies in 2016 will complete the roll-out in the agencies of the Bundeswehr Joint Medical Service.

The conversion of supply items to SASPF as a basis for the disposition and management of supply items at the Bundeswehr Logistics Centre and at BAAINBw will remain a challenge. Here, seven out of altogether 17 weapon system-specific item categories were rolled out. For this task alone about 2,600 new users were trained last year.

Decommissioning of SinN: In order to reduce the complexity mentioned earlier, several other Systems in Use will be decommissioned this year:

- SIKAM (information collection, control and evaluation system for materiel maintenance projects)
- BFW (shipyard management system)
- BEAV (operational data acquisition and evaluation procedure)
- WIDAV (maintenance and repair data evaluation procedure)

- BEL (Bundeswehr-owned stores)
- KOLIBRI (cost and performance accounting in the Bundeswehr aimed at rationalisation and internal optimisation)
- R-HAV (department-specific budgeting procedure)
- DpBestLw (Air Force depot stock management)

After decommissioning the configuration control, materiel tracking and materiel management procedure for airborne weapon systems (BMS), which is scheduled for early 2016, the complete operation of all Bundeswehr aircraft – with the exception of the FMOD's Special Air Mission Wing and the current EUROFIGHTER migration – will be managed through SASPF.

The New Bundeswehr Career Opportunities Portal

An exemplary implementation as part of the Bundeswehr's "Attractiveness Agenda" was the development of the new information portal which contains all relevant information on career opportunities within the FMOD's area of responsibility. Previously, Bundeswehr personnel had almost no possibilities to obtain information about available billets or positions in Germany and abroad that were suitable for their careers. In order to ensure user-friendly, cost-effective and quick availability, the information portal was implemented on the basis of an existing intranet application (administrative basics information system). The data required for the portal are directly downloaded from the SASPF system and made available on a daily basis. For a short response time, the data are optimised and reorganised in advance for potential search requests. Moreover, additional aids like auto-suggest functions or notices are integrated into the search pages.

The entire project was implemented within one year and has been available to the users since September.

Mobile and Digital – SASPF on Deployments and Exercises

Due to the reorganisation of logistic units as part of the reorientation of the Bundeswehr and the increasing use of SASPF, more and more personnel need access to current SASPF data and applications. This applies both to tasks within the scope of deployments, quasi-operational commitments and exercises. Especially in the field of logistics, mobile and semi-hardened SASPF workstations are required.

For this purpose, six mobile shelters were

configured and equipped in a first step. Apart from one server, several printers and up to 15 notebooks, these are equipped with network components for installing a LAN for all working areas of a logistic support battalion.

Connectivity over long distances within the Bundeswehr computer network is ensured via satellites (RBM6 and BGAN7), standard command support connections or a local internet connection. The security of the connections is ensured by the use of SINA boxes.

The access to SASPF via CITRIX servers allows the workstations to be used not only by logistics but also for all SASPF applications. This way, the access to the personnel management system could be used during a demonstration exercise of the Bundeswehr Command Support School to prepare the course certificates already on site during an exercise break.

The first shelters are already part of national exercises (GRANTIGER LÖWE) and international exercises like NATO PERSISTENT PRESENCE (Baltic states), CAPABLE LOGISTICIAN (Hungary) as well as NATO Response Force exercises. The corresponding requests made by logistic units for 2016/2017 reflect the increasing demand.

IT Support "as a Service"

With approximately 500 BAAINBw personnel and in cooperation with about 250 company employees, the G Directorate provides Bundeswehr users with reliable, up-to-date and capable applications for routine duty in all areas of the Bundeswehr. While this service philosophy and the new framework conditions of the SASPF programme strategy place high demands on the IT Service Management Organisation and its employees, it also offers a modern and attractive working environment. ■

(Endnotes)
1 ITIL® is a Registered Trade Mark of AXELOS Limited
2 Standard Application Software Product Families
3 A CCoE is an SAP-certified organisational and procedural structure that is used to operate complex IT environments with a focus on SAP applications. SinN stands for "Systeme in Nutzung" (Systems in Use).
4 "End-to-end" designates the overall view of the IT systems involved in a process from the user's perspective. Here, it is not the individual system that is relevant but the interaction of all systems involved. The "end-to-end" (e2e) responsibility comprises the coordination of all measures required for providing and optimizing the agreed services in order to ensure consistent business processes.
5 The Conscripts and Dependents Maintenance Act guarantees existential security to conscripts and their families
6 Receive Broadcast Management (mobile ground station for Bundeswehr SATCOM)
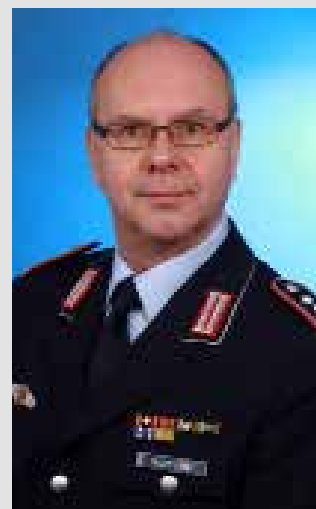7 Broadcast Global Area Network (mobile ground station for commercial internet services by Inmarsat® via satellite)

Q & A:

"High demands on the future IT support"

Interview with Colonel (GS) Dietmar Hartung, Head of the G Directorate

ESD: Colonel Hartung, you have been the new head of the Directorate since August 2015 and are thus responsible for SASPF/SinN CCoE. What is your understanding of the CCoE?

Hartung: In order to support the Bundeswehr in its mission accomplishment by providing suitable IT services, we need an organisation that provides and further develops IT services in a flexible manner to meet the highly dynamic customer requirements. CCoE is a joint organisation that includes the main process managers of the Bundeswehr, the in-service use and introduction organisations as representatives of the organisational areas, BWI as external IT service provider and my Directorate at BAAINBw. The interaction between the individual functions, roles and processes is described in the preliminary outline concept for SASPF/SinN CCoE, which is currently being tested. Concept and organisation of the CCoE were already approved on 9 September 2015 with the Primary Certification under the SAP License Agreement. I am therefore convinced that we are on the right track with this service organisation.

CCoE-Zertifikat

ESD: What are the greatest challenges in your opinion?

Hartung: SASPF is "highly integrative". I learn the true meaning of this term every day. A current example concerns the measures taken to convert Departmental Budget 14 of the Federal Budget to SASPF because they cannot be addressed only from an accounting point of view as they affect the entire Bundeswehr operation. Another challenge is to reduce the complexity of the SASPF/SinN system landscape in order to operate it in a more transparent and economical manner.

ESD: What will be the future focus of your work?

Hartung: My current focus of effort is definitely on finalising the SASPF Programme Strategy. This document describes the strategic approach of the SASPF programme between 2016 and 2022 as well as its associated projects. In addition, it describes the paradigm shift to agile project management techniques. This entails the expectation to integrate innovative and attractive technologies more quickly, to flexibly control projects under changing framework conditions and to employ existing resources in a more targeted and efficient way.

These are all high demands on the future IT support in the Bundeswehr which my staff and I will be pleased to address.

The questions were asked by Michael Horst.

HERKULES Special Organization (SO H)

Within the Federal Office of Bundeswehr Equipment, Information Technology and In-Service Support (BAAINBw) the Herkules Special Organization (SOH) is not merely responsible for the Bundeswehr's biggest IT project. Because apart from the so-called "Customer Management" concerning BWI IT which is the main task, the members of this directorate are responsible for more than 30 other IT Projects outside of HERKULES. Since spring 2013, one project division has also been working closely with the Federal Ministry of Defence (FMOD) towards the follow-on solution for the HERKULES project.

Graphics/Photos: BAAINBw

The telephone number of the UHD on a smart phone

With a contract period of ten years, the HERKULES project is the Bundeswehr's largest public private partnership. The aim is to comprehensively modernise, homogenise and economically operate the so-called administrative information technology and the Bundeswehr communication networks in Germany together with the BWI IT GmbH, an external service provider in the context of public-private partnerships until the end of 2016. This comprises more than 140,000 computer workstations, 300,000 telephones, the Bundeswehr data processing centers as well as a nationwide IT service organisation. Obviously, all of these measures have to be prepared, coordinated, improved and supervised together with the "service provider" who operates these assets for the Bundeswehr. This includes further development and technical innovation.

SO H is distributed among the locations Koblenz, Dresden and Strausberg. It is subdivided into three project divisions and the HERKULES support staff, which supports the head of SO H as staff element in his management tasks in the fields of training, organisation, personnel management, infrastructure, IT and controlling.

Customer Management for HERKULES

The Project Division H1 is responsible for implementing most components of the HERKULES IT project and other IT-projects – for example central services and mobile work. This includes the so-called Customer Management and the daily cooperation with BWI IT for the operation of the domestic IT basis formerly called IT routine operations. The planning and implementation of all IT measures (such as moving IT equipment) in the context of the reorientation of the Bundeswehr are also located in this project division.

A total of 7 branches in the H1 Project Division work on tasks ranging from programme and quality management via IT services for the central services and the adaptation of the Bundeswehr IT System in the context of the Bundeswehr reorientation to central management tasks for HERKULES. The Program Management is responsible for steering the HERKULES Project in committees and specialised working groups. The tasks of reporting and controlling in the context of continuous performance control are performed by the Program Management.

In Quality and IT-Service Management, BWI's performance is monitored and evaluated with the help of reports in order to guarantee compliance with contractually agreed standards. This helps to identify and implement potentials for improvement also with respect to cooperative actions of the users. The improvement of contractually agreed services is a permanent task.

One important domain of this project division is IT security and data protection as well as all further IT security measures connected to HERKULES which have to be closely coordinated between the Bundeswehr and BWI. In addition, the project division is responsible for the concepts of all HERKULES IT security products and configurations.

A further branch is responsible for the IT services "Bundeswehr Wide Area Network (WANBw) and telephony as well as aspects of mobile work". The spectrum comprises the development of the wide area network, the operation of the newly expanded NGN-Bw (Next Generation Network, an IP-based network) and the creation of the prerequisites for a secure network connection for "RAS-employees" (Remote Access Service) with mobile telephony and IT support. The teleworking IT project is also managed by this branch. The focus is on providing IT equipment and IT services analogous to the equipment at the workplace in the office and on setting up a secure connection with the Bundeswehr IT system.

Several IT services are combined in the "central services" branch. This includes the control of the IT services for the Internet and the Intranet, the Bundeswehr Lotus

Notes Communication Network, User-oriented Communication in the Bundeswehr or the Bundeswehr Central Directory Service. Data processing centres and the so-called "Local Servers for Systems in Use" are also managed. Currently, the members of the branch are working on the technical development of Bundeswehr online media, Public Key Infrastructure (PKIBw) with the electronic duty pass and military identification card (eDTA) or the equipment of operational contingents with terminals for User-oriented Communication in the Bundeswehr.

Budget planning and the contractual implementation of the HERKULES project are an aspect of Customer Management as well as the management of funds and an associated efficiency analysis.

The contract branch is the central point of contact for all legal issues concerning the HERKULES contracts. Its scope of action in case of performance irregularities includes demanding contract penalties. Furthermore, all contracts relating to the reorientation of the Bundeswehr IT system are concluded here.

Adaptation of the IT System to the Bundeswehr Reorientation

The implications of the Bundeswehr reorientation for IT were not foreseeable when the HERKULES contract was concluded. In order to conduct the currently more than 330,000 relocations and modifications of IT equipment, a specific project with additional funds – outside of HERKULES – was required. The "Coordination Organization for the Adaptation of the IT System to the Bundeswehr Reorientation" (KOINBw) controls all modifications of the IT system in this context. This includes planning as well as the use of independent funds and the local support of the agencies by the BAAINBw's regional management teams and BWI IT. These modifications include measures concerning IT networks, IT workplace equipment and services and IT procedures for HERKULES and Non-HERKULES IT equipment. This includes command and control information systems, C2I and weapons control systems, SASPF (Standard Application Software Product Families), systems in service (also "legacy systems" that are primarily required for administrative and logistic processes) and central services such as the Internet or the Intranet and e-mail as well as adaptations to IT security.

Apart from the ongoing IT measures for the Bundeswehr reorientation, KOINBw supports facility managers with IT measures required for the accommodation of

Graph on IT relocation during the reorientation

refugees. In this context, the responsible persons often have to support the allocation of infrastructure with quick and flexible solutions.

KOINBw coordinates the required changes to the Bw IT system in the course of handing over buildings and facilities. The services in the context of implementation range from a simple inspection of the local IT situation by the Regional Management Teams via the disconnection of facilities from the WANBw in order to comply with IT security requirements to the "emergency recovery" (quick deinstallation) of IT equipment in buildings or facilities that have to be handed over at short notice.

IT Platform Equipment HERKULES, Desktop Management and Special Software

Project Division H2 with its four branches is responsible for IT platform equipment within HERKULES. The bulk of the approximately 30 projects outside the HERKULES contract is also managed and controlled here. The spectrum ranges from the procurement of COTS IT components, support of other projects to concept development and provision of IT solutions optimised for military use.

The technical control of the IT services for Desktop Management, pertaining servers

and LAN in the HERKULES project is one of the main tasks of Customer Management. This specifically includes the support of the IT service "software distribution" which consists in the centralised automatic distribution of software programmes to all HERKULES computer workstations and peripheral equipment.

A further branch supports all projects, particularly in the technical area of project preparation and execution. It deals with research and technology studies, market exploration and test installations. For example, it is currently very active in helping to establish a major IT project for the improvement of IT support in the field of "collaboration". A universally usable test and reference environment exists. In addition, the branch processes and manages the most important open-end IT contracts in the field of COTS IT. The branch is also responsible for planning all technical and function-related IT equipment in Bundeswehr agencies.

The Bundeswehr Special Software Competence Center adapts special software and hardware to the standard HERKULES configuration in cooperation with BWI. Approximately 150 programmes are supported continuously including release and license management. Advice on alternative solutions and on the compatibility of software products are also part of the service. Certain special hardware with equipment-

Work at the Special Software Competence Center of H2.4

dependent software is tested for conformity in order to guarantee its operation or compatibility (e.g. Kenwood radio equipment used by the military police, special thermal imagers and various smart boards).

Preparation of the HERKULES Follow-On Project

The HERKULES main contract expires on 27 December 2016 after a period of ten years. In accordance with a decision made by the budget committee of the German Bundestag, the federal government will become the sole partner in the IT companies of the BWI service alliance.

An in-house company proved to be the most economically efficient solution for the future of IT operations. The transition must be organised in such a way that an uninterrupted IT operation will be ensured. The planning of the follow-on project is based on a harmonised milestone plan which contains the milestones relevant for the transition to an in-house company according to company law and the laws on service contracts. H3 division was established within SOH in order to implement the milestone plan for the follow-on project.

The uninterrupted continuation is not limited to simply continuing the current IT support for the operation of the domestic IT basis. The progress achieved with the IT-project HERKULES will also be transferred to other parts of the Bundeswehr IT system (IT-SysBw) such as parts of mission-related IT (operations and exercises).

The main milestones in 2015 were the drafting of the statement of work as part of the future service contract and the early invitation to tender for supply contracts which are required for an uninterrupted service from December 2016. Apart from that, the preparation and implementation of the measures under company law and the strategic orientation of the companies were last year's main focus.

The foundation for this, apart from the requirements contained in company law, is the "Strategic Orientation of the BWI Service Alliance as an In-house company" (BWI 2020) which was approved by Dr.

Dr. Katrin Suder, State Secretary in the Federal Ministry of Defence, approved the document "Strategic Orientation of the BWI Service Alliance as an In-house company" (BWI 2020) on 31 March 2015.

Katrin Suder, State Secretary in the Federal Ministry of Defence on 31 March 2015.

The "Strategy BWI 2020" envisages a continuous development of BWI with regard to personnel, organisation and finances based on the funds available at that point. The current IT services must be continued and improved, modernised and expanded based on the user requirements for the Bundeswehr. The advantage for the Bundeswehr is that the burden of these tasks is increasingly removed as these IT services are concentrated in BWI. Furthermore, BWI will become an IT service centre in order to be able to offer interagency services.

At the same time, the increased demands on performance and the protection of individual systems must be borne in mind. The Bundeswehr reorientation also demonstrates how comprehensive and holistic the planning process must be in order to be successful due to the profound changes to the Bundeswehr IT system. In the end these changes – in the context of the Bundeswehr reorientation – may continue until 2018 and thus end approximately two years after the expiry of the HERKULES main contract.

Taking Stock of HERKULES

There is only one year left before the HERKULES main contract expires, time to take stock.

The start of HERKULES did not run as smoothly as planned. The Bundeswehr IT landscape proved to be far more complex than was assumed during the intense preparations. Furthermore, a familiarisation phase was necessary in which users and superiors had to grow accustomed to their new roles, administrators received different tasks and BWI employees had to get to know the "Customer Bundeswehr".

Standardisation also always implies that not every user's special wishes can be fulfilled. As not everything that is desirable is required in the system or necessary for official IT equipment. This will remain unchanged in the future.

The HERKULES objectives – modernisation, standardisation and consolidation of Bundeswehr information technology in routine operations – have been reached. Thus, the Bundeswehr now has an excellent wide area network, reliable computing centres, a central User Help Desk, an uninterrupted information and network service, modernised facility networks and an efficient IT workspace environment subject to regular renewal.

Due to the provision of efficient information and communications technology at the workplace, working conditions in the Bundeswehr are good compared to industry standard. Without the lowered workload due to modern forms of cooperation and financing by the public-private-partnership with BWI, it would probably not have been possible to achieve this target.

Every member of the Bundeswehr, both soldiers and civilian employees, be it in Germany or abroad, in domestic routine operations or in operations abroad, be it in a civilian or a military organisational area, at the Federal Ministry of Defence or in the Bundeswehr will continue to work with HERKULES. ∎

Purchasing Directorate (E)

As part of the reorientation of the Bundeswehr, the creation of a new, efficient and standardised procurement and in-service process was commissioned.

The new Bundeswehr process structure is characterised by clear-cut responsibilities and decision-making powers as well as reduced interfaces. The procurement and in-service process consists of three pillars:

- Procurement of material solutions in accordance with the amended Customer Product Management (CPM nov.);
- Procurement for the satisfaction of non-project demands (Bundeswehr Purchasing), and
- satisfaction of demand via Complex Services.

Directorate E, with its offices in Lahnstein, Koblenz, and Berlin, consists of four divisions and twelve branches as well as its Directorate Controlling/Purchasing Controlling and the Directorate Staff. It is in charge of two of the three pillars of the Bundeswehr procurement and in-service process (Bundeswehr Purchasing and Complex Services). Its responsibilities also include the disposal of Bundeswehr material as well as interdepartmental and equipment assistance.

Bundeswehr Purchasing – Divisions E1 and E2

Bundeswehr Purchasing procures commercial and Bundeswehr-specific consumables and non-consumables in order to meet the so-called "operational demand" and maintain Bundeswehr operations in deployments, exercises, and routine duty, using a new, holistic approach. This includes the follow-on procurement of spare parts for weapons systems/equipment in the in-service phase, procurement via international procurement channels, and interministerial procurement.

In the past, the Bundeswehr procurement organisation used to be very heterogeneous. By establishing Bundeswehr Purchasing, an economically optimised procurement organisation with clear-cut responsibilities, operating within the legal framework and using modern methods in a context which comprises the entire Bundeswehr, was created. The defining characteristics of the newly organised Bundeswehr Purchasing are a strategic mode of operation including overarching central management and control, stringent material segment management based on the procurement market and in close cooperation with users, and a process-oriented organisational structure. Through the establishment of Bundeswehr Purchasing, a strategic procurement level – an optimised purchasing structure providing comprehensive control – has been added to the previous, mostly operative level of the procuring agencies. Overall responsibility for the purchasing process lies

ment and implementation on an agency level is handled by the executive level of Directorate E. It ensures that guidelines are implemented by all operative agencies.

The new procurement organisation Bundeswehr Purchasing is structured into "material segments", each of them based on the eCl@ss classification. Following a new mindset, supply items with identical purchasing markets are pooled into material segments.

The organisational structure of Directorate E in particular reflects this new strategy. The new strategic purchasing process will
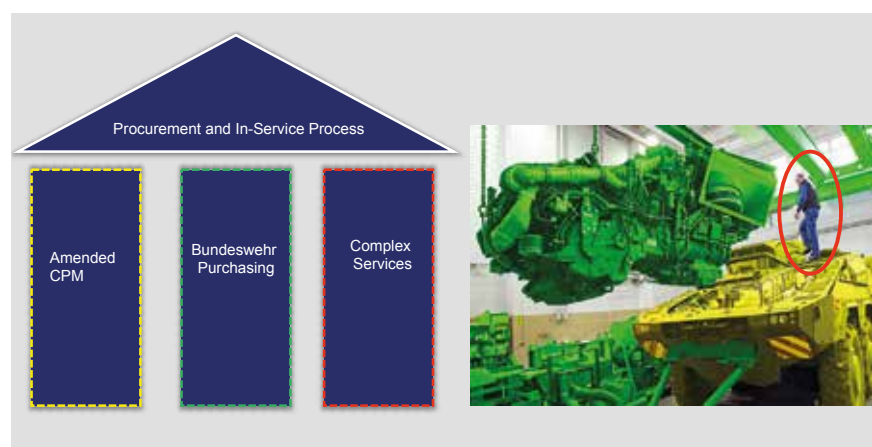
The three pillars of the Procurement and In-Service Process and their interaction

Procurement and In-Service Process

Amended CPM

Bundeswehr Purchasing

Complex Services

Source: BAAINBw

At the stand of Bundeswehr Purchasing, State Secretary Markus Grübel is briefed on the procurement of recycled paper for the Bundeswehr

Photo: BAAINBw

with division AIN III of the Federal Ministry of Defence (FMod). AIN III provides the framework for Bundeswehr Purchasing by adopting the purchasing strategy and issuing relevant guidelines. Further develop-

be introduced systematically in three stages until late 2017. Stage 1, "Creation of Bundeswehr Purchasing", was for the most part completed by 31 December 2013, introducing three pilot segments: vehicle

technology, office supplies, and medical technology.

Stage 1 has already resulted in a first success: many decentralised individual contracts in the vehicle technology segment were successfully combined into one centralised framework contract. As this step has brought about significant cost savings, options to combine other decentralised demands into centralised contracts are currently being reviewed, both in the vehicle technology segment and in other material segments.

Another area of focus is the optimisation of requirements planning by cooperating with users. Instead of frequent contract placements for recurrent small-quantity requirements, multiple delivery contracts with a duration of up to three years are to be concluded.

Contracts for the procurement of paper have been reduced and centralised, too, cutting costs for office supplies. At the same time, contracts will be changed to procure recycled paper only in order to comply with the latest sustainability requirement stipulated by the Federal Government.

When the first national Day of the Bundeswehr took place on the premises of the Bundeswehr Technical Center for Aircraft and Aeronautical Equipment (WTD 61) in Manching on 13 June 2015, Bundeswehr Purchasing was present with an information stand. One major topic was the practical implementation of sustainability requirements in public procurement by the Bundeswehr Purchasing process.

With the completion of stage 2 in late 2015, purchasing is to be optimised further, in particular with regard to data quality and availability. The aim is to make further progress in standardising and professionalising Bundeswehr Purchasing. To this end, supplier and framework contract data that have so far been managed in a decentralised manner will be pooled into a centralised database. Previously, the framework contract database only included framework contracts by BAAINBw and the Federal Office of Bundeswehr Infrastructure, Environmental Protection and Services (contracts of the former military district administrative offices). Under the Bundeswehr Purchasing process, all framework contracts placed by the Bundeswehr are to be merged in one common framework contract database (GemRVDBBw), including framework contracts placed by the Bundeswehr service centres and subordinate agencies of BAAINBw.

This will make all information on Bundeswehr framework contracts available to purchasing staff in a modern database, providing strategic purchasing personnel with

a reliable and encyclopedic data source. The key objective, however, remains the documentation, maintenance, and presentation of framework contract data for each item in SASPF (Standard Application Software Product Family). Furthermore, additional material segments (including electrical technology, energy and secondary raw materials, housekeeping and housekeeping technology) have been converted into the new purchasing process as part of

Photo: Bundeswehr/Schmitt

The use of recycled paper as one example of sustainability

procurement planning in 2015. In the third and last stage starting in 2017, Bundeswehr Purchasing is to be applied to all material segments.

The responsibility for the Bundeswehr Purchasing concept, its continuous improvement, and the change management required in this context lies with Division E1 of BAAINBw's Directorate E. A network-based "Bundeswehr Purchasing Information Platform" was created in the Bundeswehr to serve as a control and information tool.

Division E1 is also responsible for gathering the necessary data and making it available to specific addressees.

In addition, E1 handles the following tasks:

- generating and providing purchasing documents (e.g. order catalogs), purchasing statistics and reports for BAAINBw;
- acting as a drawing and design office for BAAINBw, and
- collecting company proposals for BAAINBw.

One major challenge is the migration of procurement receipts and item-related master data to SASPF. As the procurement of supplies is converted from the MBF process based on materiel requirements requests to the BANF requisition procedure under SASPF

by means of so-called "in-service systems" (IT systems for administration applications that are gradually being transferred to the SAP standard software as part of the SASPF project), requirements to the quality of master data will increase, making purchasing significantly more complex for the time being. Following that, however, improved data quality will increasingly facilitate the material segment procurement described below, which is handled by Division E2.

Division E2 is responsible for procuring all follow-on spare parts required by the armed forces for weapons systems and/or in-service phase equipment. A considerable portion of orders is placed based on competitions involving medium-sized businesses. Some two million supply items have to be procured, ranging from small components such as bolts, nuts, and gaskets (i.e. commercial material) to specific material for equipment and complex weapon systems like the CH 53 helicopter, frigates, or the Leopard MBT. For almost 500,000 of these items, there is a constant demand.

E2 concludes contracts for POL products (fuel, lubricants and similar products) including their storage, handling, and pipelines for the Bundeswehr in Germany and abroad as well as other federal authorities, and facilities to pool resources at a federal level; the division also places contracts for office supplies (including printer and copying paper), print products (service regulations, forms, etc.), and expendable medical items (medical consumables and medicinal products).

Division E2 is organised in material segments in accordance with the eCl@ss structure.

This structure allows a targeted demand on the procurement markets, as specific procurement strategies can be developed and

implemented for each materiel segment. Each material segment is headed by a materiel segment manager who has directive authority across organisational boundaries. This ensures that there are purchasing experts for specific material segments, facilitating standardised procurement in the materiel segments throughout the Bundeswehr und leading to pooling and synergy effects.

Generally, Bundeswehr Purchasing has initiated a paradigm shift in non-project procurement. "This constitutes a move away from thinking in terms of cost in decentralised structures originating in the past and towards a focus on added value in the context of centrally defined procurement strategies."

Individual contracting authorities across the Bundeswehr thus lose their primacy in the procedural organisation and become an integral part of the materiel segments. Their early integration – as early as during development of the materiel segment strategies – facilitates the implementation of different procurement levers taking the legal framework into account.

Changing the mindset within the Bundeswehr in this regard without putting supply at risk will be crucial. Structures that have grown over decades cannot simply be overthrown within days. However,

once the key elements of the new strategic mode of operation with its centralised and overarching management and control system, the material segments, and its process orientation are in place, they will act as a driving force for long-term organisational development.

Complex Services – Division E3

Public-private partnerships/complex services are the third pillar of the equipment and in-service process. They consist of the following key elements:

- comparing options to satisfy demand ranging from a completely official fulfilment of public tasks on the one end of the spectrum to the total outsourcing, i.e. contracting, on the other end;
- developing and evaluating these different options – if necessary, by utilising additional manpower –, and
- scheduling the timeframe for migration (linking to Bundeswehr business processes and hand-over to a third party) to ensure the successful transition from the realisation phase to the in-service phase.

BAAINBw's Directorate E has had the awarding, contracting and economic authority concerning complex services projects for a long time.

An additional organisational element for project management which handles the technical-logistical as well as the overall management of projects has been created with Branch E3.1. It systematically develops and implements complex service projects. Interdisciplinary cooperation across organisational areas and agencies is not just possible but already provided for. This will be implemented by a specific form of cooperation – similar to the amended CPM. The aim is to develop customised and economic capabilities for our armed forces in compliance with the legal framework, in a timely manner, and in cooperation with industry. Currently, Branch E3.1 handles project management tasks for NBC material package 1 (materiel management for Bundeswehr personal NBC protective equipment and clothing), NBC material package 2 (materiel management for common and weapon-system specific NBC defence materiel of the Bundeswehr), and central Bundeswehr spare parts logistics ("ZEBEL" – supply of civilian and selected military maintenance facilities with Bundeswehr-owned spare parts by a private contractor).

Branch E3.2 is responsible for contractual supervision of the above-mentioned projects NBC material packages 1 and 2, the ZEBEL project, as well as the basic driving training project (conducted by a private
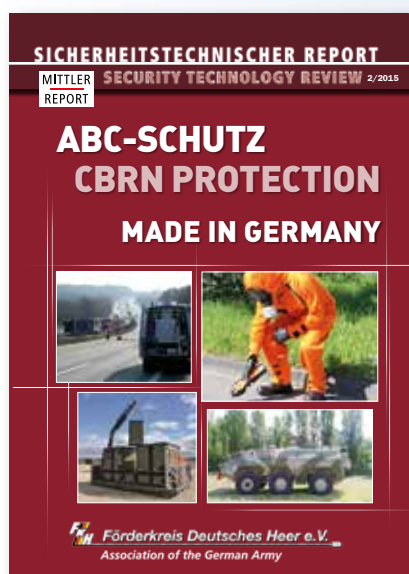
contractor, for obtaining a Class D driving license for busses). In addition, E3.2 handles the placement and management of Bundeswehr contracts concerning transportation (by road, rail, air and sea), tasks that used to be handled by the Federal Office of Bundeswehr Infrastructure, Environmental Protection and Services (BAIUDBw) until January 2013. Branch E3.2 has thus become the central contracting agency for the Bundeswehr's transport requirements, with regard to both routine duty and deployments (e.g. resupply and redeployment for ISAF, EUTM Mali, resupply for ATALANTA, etc.).

In this connection, Directorate E also takes part in initiatives to improve cooperation with industry and allied partners by participating in the Logistics Round Table and in international bodies (e.g. on NATO level).

Since late 2014, E3.2 is also in charge of the award and contract management for the "PPP Bundeswehr Air Traffic Control Training in Kaufbeuren" project. As of 2017, Deutsche Flugsicherung DFS GmbH, a German provider of air traffic control services, is set to be contracted under an in-house assignment. Contract conclusion was scheduled for early 2016.

Project management for the projects "Optimised clothing management 2016+"

Image: BAAINBw

Bundeswehr Purchasing technical information platform

(OMB 2016+), "Bundeswehr vehicle fleet management" (BwFPS), and "Army maintenance logistics" (HIL) has been assigned to a temporary work organisation called "PrOFHI". The business-administrative competence of the purchasing directorate is pooled with Branch E3.4. This branch is responsible for price negotiations for Divisions E2, E3, and E4.

Apart from supporting ongoing projects, Division E3 is closely involved in the development of follow-on projects and solu-tions. Its particular responsibilities are project management, conducting expression of interest procedures, awarding procedures, as well as contract implementation and support.

Consequently, the technical-logistical, legal and economic expertise for a large part of the complex service projects in the Bundeswehr is concentrated in Division E3. This "one-stop shop" processing concept creates access to optimisation and acceleration processes in project work.
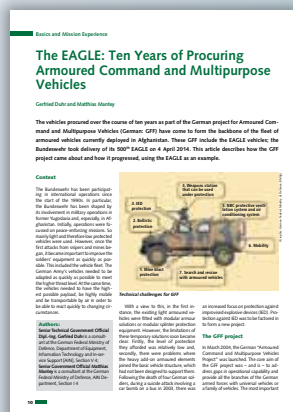
Disposal of Bundeswehr Material, Interdepartmental and Equipment Assistance – Division E4

Division E4 handles a broad range of tasks, including, for the most part, the disposal of material no longer required by the Bundeswehr, governmental purchases (Foreign Military Sales, FMS), interdepartmental and equipment assistance for friendly nations, cooperative logistics, and the management of the material surplus caused by the restructuring of the Bundeswehr.

It controls and supervises the process chain from detecting and discarding a surplus to utilisation or disposal for the whole range of material across organisational lines. At present, the focus remains on agencies being closed, utilising material of US origin for which an end use certification has been issued, and relieving the pressure on stationary logistic facility by supporting measures of the disposal organisation.

question is recycled. For this purpose, the relevant recycling contracts (at a cost) with companies are negotiated and concluded.

Aside from disposal, E4 handles a wide range of other tasks, including contractual implementation of the equipment aid programme of the Federal Government, the support of Government quality assurance contracts, as well as governmental purchases under the US Foreign Military Sales process. Some 300 FMS contracts with
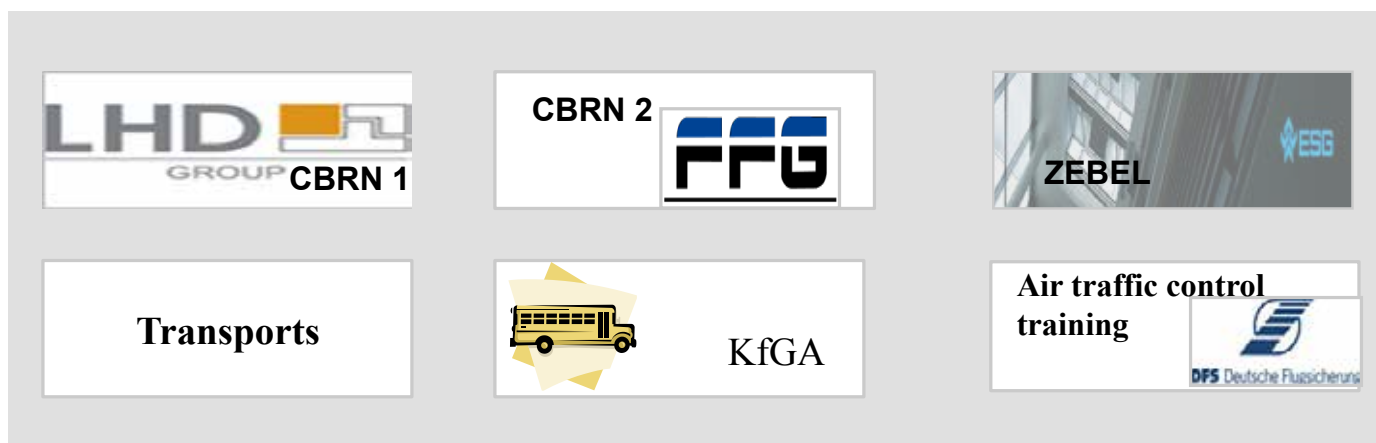
Source: BAAINBw

Contract management for the above-mentioned projects

of contracts that cannot be assigned to another BAAINBw element.

Branch E4.1 controls and supervises disposals to relieve the Bundeswehr of any unserviceable or surplus material in good time, to minimise costs incurred through condemnation, recycling, and disposal of Bundeswehr material, and to maximise proceeds from utilisation. Particular attention is paid to compliance with the War Weapons Control Act, the Closed-Cycle Economics Law, environmental legislation, as well as demilitarisation and elimination of any obstacles to utilisation. Suitable material – except for war weapons and material containing radioactive substances – will be sold to third parties through the VEBEG (federally-owned trust company disposing of phased-out property of the Bundeswehr and other public purchasers). The VEBEG also handles politically relevant transfers of materiel to foreign countries and equipment aid for relief organisations – activities that contribute to a positive image of the Bundeswehr but go mostly unnoticed by the general public. At present, humanitarian assistance is a field requiring flexible and speedy action.

One important forum is the Integrated Project Team (IPT) "Condemnation" which is, in fact, not an IPT according to the amended CPM. The IPT "Condemnation and Utilisation" was established with the aim to speed up the condemnation and utilisation

Branch E4.2 is responsible for the contractual implementation of disposal decisions. Once Bundeswehr material has been phased out, the priority objective is to re-use surplus material by transferring it to friendly governments, manufacturers, or museums, preferably by selling it. In addition to transferring materiel to foreign (friendly) countries, E4.2 also negotiates and concludes agreements on procurements (such as spare parts or accessories) and services (e.g. maintenance of contractual items) with friendly states as part of interdepartmental assistance. If no re-use is possible, the material in

a volume of four billion US dollars are in place. Other tasks include preparing contributions for the information exchange for arms control treaties (CFE Treaty, Vienna Document, UN Register of Conventional Arms), negotiating contracts for the Scientific Collection of Defense Engineering Specimens and the Technical Information Center, as well as supporting liaison agencies and the Canadian procurement office, e.g. by means of legal advice in case of awarding difficulties. Last but not least, E4 provides logistic support for the use of the Leopard MBT and renders the accounts for services provided to partner states. ■

Quality/Logistics Directorate (Q)

The Quality/Logistics Directorate (Q) is subdivided into the Divisions Q1 to Q3 and has a very heterogeneous and wide-ranging portfolio of tasks. These Divisions focus on providing comprehensive system-related and interdisciplinary support to the Project Directorates, are responsible for Government Quality Assurance and Control and assist in performing conceptual and operational tasks from the logistics spectrum under the responsibility of the organisational area Equipment, Information Technology and In-Service Support (AIN).

When implementing, fielding and using defence materiel, the system-related protection tasks, which include all statutory and non-statutory protection tasks, must be fulfilled.

As a rule, the German Occupational Health and Safety Regulations also apply to the workplaces of soldiers during routine operations and on operations as well as to the civilian personnel carrying out trials or performance tests. Bundeswehr personnel, therefore, are entitled to health protection at the workplace and to humane working conditions in the same way as employees working in trade and industry.

Also, Bundeswehr weapon systems must not have any adverse impacts on the environment. Apart from the classical tasks, due to the large dominance of intelligent system components in Bundeswehr weapon systems, the fields of "functional security and/or software security" have increasingly become a focus of activities when evaluating system security.

The programme managers for the respective weapon systems are responsible for the observation of these regulations. In the context of system support in the project elements "occupational health and safety, environmental protection and ergonomic design" and the observation of regulations in the field of weapon system safety and ammunition safety they are supported and advised by engineers and scientists of the Q1 Division "system-specific protection tasks, foreign defence materiel". The Division Chief of Q1 also acts as the BAAINBw safety engineer.

Occupational Safety

Occupational safety covers the areas of occupational and radiation safety, technical and electrical safety, fire protection, ship safety and the safe handling of hazardous material as well as of weapons and ammunition during the procurement of products i.a.w. the amended Customer Product Management (CPM (nov.)).

Occupational hazards for soldiers may result from the defence materiel itself (such

Occupational health and safety and environmental protection at the example of a Bundeswehr armoured transport vehicle

as hazards caused by moving parts, noise and vibration, dangerous substances, radiation such as electromagnetic fields and laser) and working conditions (such as working at great heights, working in darkness or in adverse weather). Complex weapon systems also require an increasing level of software safety.

Hazardous substances management introduces methods to observe hazardous substances regulations in support of the project managers and procurement and in the development of products and operational requirements as well as to check the information and safety data sheets on hazardous substances for validity and plausibility. As part of public procurement, the Bundeswehr technical supervisory body may task and authorise engineers to inspect and examine material handling systems, pressure equipment, cranes and lifting gear that require monitoring.

Environmental Protection

The area of work "environmental protection" analyses and assesses the dangers for the environment arising from defence materiel and, above all, keeps them at the

lowest possible level. To this end, the negative impact that a piece of equipment has on the environment during its entire life cycle – from its development to its disposal – is, first of all, to be identified and then minimised. As a general rule, preference is to be given to the material with the lowest risk potential.

Ergonomic Design

The primary focus in the area of ergonomic design is on human requirements and a user-friendly design of the defence materiel. The aim is to improve the commandability, operability and usability of items, paying particular attention to stress factors in military operations. Demographic change i.e. the changing socio-physiological parameters of the population exert an additional significant influence in this context.

The set-up of the workplace in particular with regard to operability, seats, space to move and hand grasp area as well as the conditions concerning ways in which information is perceived and processed are decisive for user friendliness.

Flaws in ergonomic design add to the operator's or user's physical and mental stress level and must be avoided.

Division Q1also coordinates and supports a pilot study on occupational health management for the employees of BAAINBw in Koblenz/Lahnstein. Apart from that, Division Q1 coordinates and manages interdisciplinary research and technology projects in the fields of materials, fuels and lubricants, occupational health and safety, environmental protection and ergonomic design.

Another important task assigned to the Q1 Division is the evaluation of foreign defence materiel. This work creates valuable foundations for the analysis of capability gaps in the Bundeswehr or the technical adaptation of fielded Bundeswehr systems to new threats. Research and technology projects are carried out in this field as well.

The main responsibility of the Q2 Division, which is also known as the "Bundeswehr quality assurance authority", is to assure the quality of defence materiel, mission relevant or fiscal items and complex services provided to the Bundeswehr, NATO partners or friendly nations.

Q2 consists of a Policy Branch, four Technical Branches and 26 Government Quality Assurance Offices , located mainly at the respective defence materiel contractor's premises.

The Policy Branch is responsible for basic quality assurance tasks and national and international cooperation. The Technical Branches cooperate closely with the project divisions or the respective non-BAAINBw agencies, devise contractual quality assurance requirements and provide technical

A Government Quality Assurance Representative from the Government Quality Assurance Office in Manching, attending an operational test during production of the Eurofighter TYPHOON

assistance to the Government Quality Assurance Offices. They also perform central certification and quality assurance monitoring tasks.

The 26 Government Quality Assurance Offices carry out quality assurance activities at the contractor's site. They do not only carry out contractual quality assurance activities, i.e. making sure the contractor fulfils contractual quality requirements, but also perform quality assurance tasks for other government agencies.

The Government Quality Assurance Offices base their work on NATO quality assurance requirements, the Allied Quality Assurance Publications (AQAP) and the intensity and depth of quality control with which the Government Quality Assurance Representative monitors manufacturing depends on the identified individual quality risk.

The Government Quality Assurance Offices are not only responsible for quality assurance, they also take care of maintenance work to be carried out by industry on Bundeswehr defence materiel, starting with defining the scope of maintenance to issuing maintenance orders and auditing invoices.

Within the Q Directorate, the Bundeswehr Government Quality Assurance Offices work independently of Project Divisions and the bodies managing the contract. With regard to these tasks they exclusively answer to the BAAINBw executive level.

The Q3 Division with its seven Branches covers all aspects of logistics relevant to BAAINBw. The Division, therefore, is the direct point of contact for the Bundeswehr Logistics Command in all matters of logistics.

The spectrum of logistics encompasses conceptual work and policy matters, support of Project Directorates and BAAINBw agencies as well as operational and logistic tasks for that particular organisational area. Logistics guidelines will also be determined

Photos: BAAINBw

A Government Quality Assurance Representative from the Government Quality Assurance Office in Kassel, monitoring the factory trials on the PUMA IFV overall system demonstrator

for individual tasks in the Logistics project element (e. g. material management, Integrated Logistic Support-ILS/Logistic Support Analysis-LSA), material information and basics, obsolescence management, configuration and change management, technical reliability and the application of Automated Identification Technology.

In the fields of import, export and transport, Q3 is also in charge of defining technical responsibilities, end-use control and of the Documentation Center for Loans and Furnishings within the organisational area of Equipment, Information Technology and In-Service Support.

In addition, Q3 serves as the central point of contact in matters relating to Bundeswehr software licenses to ensure that software is used in a legal and efficient manner.

To put it in a nutshell, Q3 "Logistics" is responsible for four main areas:

Conceptual Tasks
- Equipment/In-Service Support/Logistics Procedures and Processes;
- Logistic Process Manager for the Armaments/Logistics main process within the organisational area of Equipment, Information Technology and In-Service Support;
- Standardisation.

Policy Matters
- Terminology concerning Equipment/In-Service Support/Logistics;
- Automated Identification Technology (AIT);
- Software license management;
- Material Information and Basics;
- Configuration and Change Management;
- Obsolescence Management;
- Technical Reliability;
- Policies for individual tasks in the Logistics project element (e. g. material management, Integrated Logistic Support-ILS/Logistic Support Analysis-LSA).

Supporting Tasks
- Technical and Requirements Planning for Maintenance;
- Depot Level Maintenance Planning and Follow-on Requirement of Individually Issued Expendable Items;
- Import and Export Matters, End-use;
- Transport Matters;
- Bundeswehr IMP Office (Information Procedure Material Planning Designation);
- Cataloguing and preparation of logistical master data;
- Provision of Expertise for Logistical Projects;

- Coordination of all Materiel Condemnation Activities within BAAINBw.

Operational Logistics (Equipment, Information Technology and In-Service Support)
- Technical Supervision of Order Processing, Material Management and Maintenance of Agencies;
- BAAINBw and Agencies, Equipment;
- BAAINBw and Agencies, Infrastructure;
- Documentation Center for Loans and Furnishings within the organisational area of Equipment, Information Technology and In-Service Support and Agency Furnishings.

The Q Directorate is completed by the Staff Directorate (QAS) and the Controlling Directorate (QAC).

The Staff Directorate serves as the interface to the Z Directorate and is responsible for all organisational and personnel matters. QAS also manages training, security and official trips.

The Controlling Directorate assists the director in the field of strategic controlling. The aim is to provide information relevant for decision-making so as to enable the executive level to fulfil and optimise the tasks attributed to the Q Directorate in an effective manner. ■

Central Affairs Directorate (Z)

The Central Affairs Directorate is responsible for central administrative matters in the Federal Office of Bundeswehr Equipment, Information Technology and In-Service Support.

Six divisions with a total number of 25 branches and a directorate staff deal with the multi-faceted spectrum of interdisciplinary and general administrative matters. Directorate Z is thus the central service provider for BAAINBw and its agencies.

Division Z1

Division Z1 consists of the branches "Organisational Structure/Organizational Procedures, Supervision and Performance Process Management of the performance process 'Providing Materiel Solutions i.a.w. CPM (amended)'" (Z1.1), "Commercial Policies, Accounting, Organisational Studies, Manpower Requirement Calculation" (Z1.2), "Security, Alerts, Security Officer" (Z1.3) and "Internal Services" (Z1.4).

This Division deals with organisational and procedural overarching and general administrative matters of the office. Not only does it determine the organisational structure of BAAINBw and its agencies but it also develops regulations with respect to both the administrative area and project management. Furthermore, this Division is responsible for organisational studies, manpower requirement calculation and commercial policies (cost and performance accounting). Moreover, Z1 is responsible for personnel and materiel safety. The Administrative Data Protection Commissioner is also a member of Division Z1 . The liaison office with the Bundeswehr service centre (BwDLZ) for coordination and general tasks with respect to real estate and accommodation affairs is also part of Z1. Postal and messenger services, registry and BAAINBw inventory management complement the task spectrum of the Division.

Division Z2

The structure and distribution of tasks of Division Z2 "Finances" are characterised by the special tasks of BAAINBw, which is not just a major procurement office of the Federal Republic of Germany and thus an important contracting authority but has also been responsible for the operational readiness of Bundeswehr defence materiel since its foundation on 1 October 2012. Approximately 8.08 billion Euros were available to the office in order to fulfil these tasks in 2014. Apart from that, the budg-

etary funds for the administration of the office are managed by this Division. In 2014 the available funds were used to authorise the payment of about 143,000 invoices.
Division Z2 consists of the following branches: "Budget Policy, Government Claims and Allocations, Tax Affairs" (Z2.1), "Funds Management, Investments" (Z2.2), "Funds Management, Operation" (Z2.3) as well as "Contract Accounting" (Z2.4).
Apart from policy matters concerning tax and budgetary law Z2.1 is involved in contract auditing and consulting i.a.w. Articles 58, 59 and 63 of the Federal Budget Code (BHO).Furthermore, all government accounts receivable (e. g. claims for repayment, contract penalties, interest etc.) are monitored and recorded accordingly, all taxes payable by BAAINBw and its agencies are paid centrally. For funds held in trust for partner nations in the context of binational or multinational agreements, account management contracts are concluded with commercial banks, they are managed and the required payments are authorised. The government allocations assigned by BAAINBw and its agencies i.a.w. Articles 23 and 44 of BHO are also audited centrally. In the field of disposal, the Branch assumes the tasks of the budget officer.
The main task of Branch Z 2.2 is the management of funds for research and technology and for the development and procurement of defence materiel. Apart from that, the Branch manages the funds for urgent operational requirements and the German share in the administrative budgets of NATO agencies. In 2013 the Branch assumed the task of Investment Budget Item Management. The budget item managers are the interface between the user and the project managers for planning and budgeting when procurement measures are implemented.
Apart from budget item management, Z2.2 also centrally authorises all payments made by the office. Furthermore, members of the Branch with special tasks secure the smooth operation of existing, budget-relevant IT procedures, work on the conceptual development of these procedures or define new budget processes in this context.
The range of tasks of Branch Z 2.3 includes the management of funds for maintaining

the operational readiness of equipment and funds for maintaining and conducting the routine duty of BAAINBw and its subordinate agencies. The Branch also manages the funds for information technology and for the Bundeswehr information and communications system. The management of funds for private operator models in the fields of clothing management, army maintenance logistics and the vehicles of the fleet management are part of the Branch's range of tasks.
The tasks of Branch Z 2.4 include contract accounting for contracts concluded by the BAAINBw, monitoring of delivery dates, final price negotiations and claims for repayment and interest on possible overpayments subsequent to the price audit.

Division Z3

Division Z3 "General Legal Issues" consists of four branches. Z3.1 deals with legal issues concerning procurement procedures and policy issues concerning public contract awarding. Z3.1 also exercises the technical supervision of the BAAINBw's agencies' contracting activities. Furthermore, the Branch assists in supervision of the Bundeswehr corporations (BWI, HIL, LHBw, BwFPS, g.e.b.b.) in terms of contract awarding law.
The responsibilities of Branch Z3.2 include civil law aspects of contract consulting and contract review. The Branch is also the point of contact in case of legal disputes with BAAINBw contractors about contractual issues. Cases of insolvency, execution, damage claims and liability issues are also dealt with in this Branch.
Z3.3 assumes tasks relating to employee inventions/service inventions, industrial property rights (patents, trademarks, utility and design patents) and copyright matters within the Bundeswehr. Moreover, the Branch concludes licensing agreements covering the marketing of Bundeswehr rights as well as contractual agreements on user rights.
Z3.4 is responsible for the conclusion of project-related departmental agreements (Memorandum of Understanding – MoU) within the scope of international armaments cooperation.
Z3.1, Z3.2 and Z3.3 jointly conduct quality assurance on contracts for major BAAINBw projects.

Division Z4

Division Z4, "Coordination of Personnel, Scientific Collection of Defense Engineer-

Directorate Z is the central service provider for the BAAINBw and its agencies.

(Photo: mawibo)

ing Specimens (WTS), Technical Information Center (FISt)" has assumed the tasks of an employing agency for the civilian and military personnel.

Z4.1 is in charge of coordinating BAAINBw civilian personnel affairs and thus central point of contact for Bundeswehr personnel management agencies. In particular, its responsibilities include personnel management for BAAINBw as employing agency. In the context of personnel matters, this Branch also cooperates with and supports the Federal Office of Bundeswehr Personnel Management (BAPersBw) and the Bundeswehr Service Centers (BwDLZ).

Branch Z4.2 is in charge of coordinating military personnel. The chief of Branch Z4.2 is also the commissioner for military personnel matters and the disciplinary superior of all officers in BAAINBw up to the pay grade A15 as well as the deputy commissioner for reservist affairs of the organisational area for Equipment, Information Technology and In-Service Support (AIN).

As a consequence, the Branch's range of tasks covers the traditional tasks of "Innere Führung" such as the military disciplinary system and all administrative complaints proceedings, the entire range of military personnel affairs, policy concepts and policy tasks concerning personnel management and reservist support up to military training. The tasks in the area of military training include planning and conducting all measures to maintain the individual basic skills, i.e. maintaining military skills and the physical fitness of soldiers.

Z4.2 is the most important link between the BAAINBw and the central personnel management agencies for military personnel and all military and civilian training facilities.

The Scientific Collection of Defense Engineering Specimens (WTS, Branch Z4.4) is a part of the training and advanced training programme for many Bundeswehr units and for young defence engineers working in the equipment, IT and in-service support area (AIN). The scientific collection shows which possible solutions in terms of design, function and concept are incorporated into a piece of equipment and how technical know-how is used for new and further developments within the scope of a specific project.

With its 3,000 exhibits and a size of 7,200 square meters and an exhibition open to the public in Koblenz, the scientific collection also accomplishes the task of information and education.

The Technical Information Center (FISt) of BAAINBw (Z4.5) researches, acquires, processes and archives technical information needed for official purposes (e.g. study and final reports with respect to defence technical tasks, publicly available literature, regulations and standards) and centrally provides them to members of BAAINBw and its agencies. Bundeswehr contractors obtain technical information on the basis of contractual arrangements for government-furnished material. Just like Bundeswehr contractors, Bundeswehr units deployed abroad are provided with service regulations via the Internet Regulations Portal DvWeb. Furthermore, the FISt centrally assumes administrative tasks relating to Technical Manuals for the BAAINBw project directorates. This includes keeping equipment history records, storing file copies, initiating decree processes and the editorial review and publication of special directives to maintain operational readiness.

Division Z5

Division Z5 is subdivided into the following Branches, "Price Audit Policy/Common Issues" (Z5.1), "Price Audit – Airframe/Engine" (Z5.2), "Price Audit – Maintenance for Armed Services, Missiles, Other Aeronautical Equipment" (Z5.3), "Price Audit – Electronics, Sensors" (Z5.4), "Price Audit – Weapons and Ammunition, Tracked and Wheeled Vehicles, Ships and Boats, Other Equipment" (Z5.5) and "Cost Competence Center" (Z5.6).

The tasks of Z5.1 range from central control of price audit tasks to dealing with policy requests regarding 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, cooperation with the pricing agencies of the German states, support to multinational organisations and the NATO Programme Offices and official assistance for foreign governments. The operative price audit branches Z5.2 to Z5.5 technically and economically evaluate if cost prices are appropriate according to price law. For this evaluation they use detailed cost data and documents and assess the quantities and valuations.

The Cost Competence Center supports the economic execution and implementation of projects and organisational measures in all phases of the amended CPM procedure by means of parametric cost estimates, profitability evaluations, assessments of alternative forms of procurement and review and staffing of phase documents. In special cases, additional profitability analyses are conducted outside the scope of the CPM. Apart from that, Z5.6 is the central point of contact concerning life cycle cost management in BAAINBw. The Branch holds presentations on the above-mentioned subjects on request.

Division Z6

Division Z 6 consists of three Branches and assumes central IT coordination tasks, control and support of IT operations (Z6.1), the Introduction and In-service Organisation of SASPF (Standard Application Software Product Family) (Z6.2) and the Main Process Management Armaments/Logistics, armaments portion (Z6.3) for the office itself but also in part for the organisational area of Equipment, Information Technology and In-Service Support (AIN).

The Division's responsibilities comprise a range of IT equipment management tasks (IT coordination centre AIN, BAAINBw IT officer), user-service, service support for the Intranet and the Internet, up to process-related/technical specifications of armaments processes for their future IT support in SASPF. The focus is also on the coordination of the ongoing introduction and use of SASPF functions in the AIN area.

The range of tasks of the Z6 Division also covers the functions and/or roles of the agency IT security officer (BAAINBw) and the IT security officer for the AIN area. ■

The BAAINBw Agencies

Providing the Bundeswehr with modern technology and safe equipment in accordance with demand and requirements at economic conditions is the key task of the Federal Office of Bundeswehr Equipment, Information Technology and In-Service Support (BAAINBw). Thus, the focus of its work is on the development, testing and procurement of defence materiel.

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

The Agencies' Range of Services Is Varied

The spectrum comprises specialist technical inputs to all phases of the defence materiel development cycle as well as testing and specialist technical evaluation of defence equipment in the context of integrated compliance demonstration. Preparation of expert reports in the event of accidents, damage and warranty cases is also carried out here. The work on R&T projects gives the Bundeswehr access to modern technologies. Due to the specialised technical support of the BAAINBw project management, project risks can be minimised and test findings taken into account.

The participation in national and international armament programmes shapes the work processes. Both at national and international level, the agencies cooperate closely with other technical and military agencies, test centres, companies, research institutes, universities and programme offices.

The agencies' range of services is completed by training courses and the training of technical personnel for the entire Bundeswehr, partly also at their own training facilities.

An Overview of the BAAINBw Agencies

The Bundeswehr Technical Center for Land-Based Vehicle Systems, Engineer and General Field Equipment (WTD 41) in Trier, is responsible for the technical investigations, evaluations and trials of all vehicles (wheeled and tracked vehicles,

(Graphic: mawibo-media)
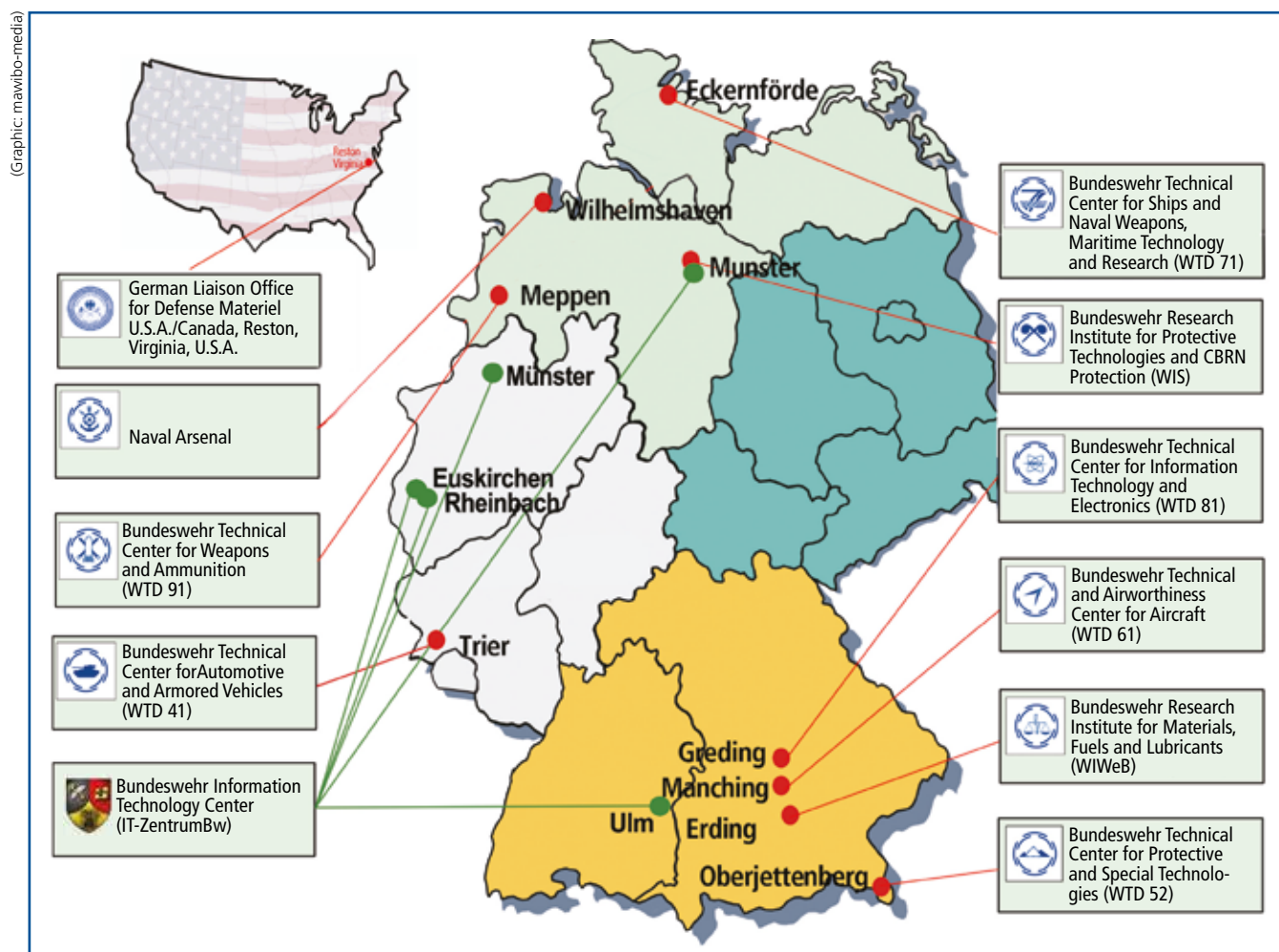
Testing of MRS275 with waterproof protection gear, small boat crew

Photo: WIWeB

special purpose vehicles as well as vehicles with various add-on structures) and vehicle components of the Bundeswehr.

To handle its comprehensive tasks, WTD 41 has numerous test tracks and terrain courses of various surface conditions and degrees of difficulty. Used for the conduct of mobility trials, they permit a broad spectrum of different investigations which yield the highest possible amount of reproducible values.

It also operates the technology competence centre for engineer and general field equipment used by the Bundeswehr. Apart from specific technical tasks in the fields of hydraulics, mobile power supply systems, compressed-gas technology and HVAC engineering, WTD 41 is in charge of testing armoured vehicle-launched bridges, dry gap bridges, floating bridges, amphibious bridging systems, ferries, assault boats and amphibious land vehicles, to the extent that their amphibious capabilities are concerned.

Situated in the Bavarian Alps, **WTD 52, the Bundeswehr Technical Center for Protective and Special Technologies,** has unique infrastructure at its disposal in the form of a mountain trial site located at an altitude of more than 1,700 m above sea level and an underground complex with an extensive tunnel system.

Current key tasks of the agency are the design and evaluation of passive protection measures for Bundeswehr installations in deployment areas and their adaptation to a constantly changing threat situation. As far as indirect protection is concerned, prod-

ucts such as camouflage patterns, camouflage sets, models or comprehensive signature adaptation concepts for worldwide use are being developed. Another issue of operational relevance are non-lethal weapons, of which WTD 52 is also in charge. Furthermore, this WTD handles route clearance tasks as one aspect of the Counter-Improvised Explosive Devices (C-IED) range of tasks.

The **Bundeswehr Technical Center for Aircraft and Aeronautical Equipment (WTD 61)** is the Bundeswehr authority responsible for ensuring that all aircraft in service are safe and efficient – in the interest of both the air crews' and the population's safety.

Thanks to its facilities and equipment (airfield with two runways, a drop zone and test aircraft fitted with state-of-the-art metrological equipment), WTD 61 is in a position to perform most of its test and evaluation tasks on site in Manching.

The **Bundeswehr Technical Center for Ships and Naval Weapons, Maritime Technology and Research (WTD 71),** with its Institute for Underwater Sound and Geophysical Research, provides defence-related technical and scientific expertise in the field of maritime research and development for the Bundeswehr. For the specification and testing of maritime weapon systems, the agency has a range of technical installations – some of which are unique – at its disposal, such as facilities for magnetic ranging and degaussing of ships, underwater and surface range tracking systems, torpedo firing position and range, naval engineering test stands and a fleet of modern trial ships including the PLANET research ship.

Within the scope of activities of **WTD 81, the Bundeswehr Technical Center for Information Technology and Electronics**

Image: Bw IT Center

Operational testing of C2 information system

Photo: WTD 71

Shock test stand at WTD 71, Kiel

protection in the Bundeswehr. It provides its wide scope of technical expertise also on other issues such as the protection against electromagnetic effects, environment protection, occupational safety and health and radiation protection, both for the defence sector and for other government departments.

WIWeB, the Bundeswehr Research Institute for Materials, Fuels and Lubricants in Erding (with a branch office in Wilhelmshaven), is the only agency within the armaments organisation with responsibility for all technical issues related to materials including fuels and lubricants. This includes the fields of surface technology, material protection, safety of chemicals, occupational safety and health and environment protection. WIWeB also plays a key role in the field of

in Greding, the emphasis is on tasks in the fields of information transmission and processing, information collection and electronics.

One of the facilities which WTD 81 uses to accomplish its tasks is Europe's largest fully shielded building for the study of electromagnetic compatibility (EMC) and electromagnetic effects and the Center for Interoperability, Network-Enabled Operations and Simulation **(ZINS)** in order to conduct experiments on interoperability and performance in a network of systems across projects. Furthermore, the agency operates a centre for multispectral target and scenario simulation in one of the largest dome structures worldwide.

WTD 91, the Bundeswehr Technical Center for Weapons and Ammunition, is the main test and evaluation centre for weapons and ammunition of the Bundeswehr. Its test range is located near the town of Meppen and covers an area of almost 200 km², thus forming the largest fully instrumented ground firing range in Western Europe, where ammunition of all calibres can be fired. WTD 91 is responsible for testing and evaluating weapons and weapon systems, ammunition of any type, rockets, guided missiles, UAVs, airdropped ammunition, optical and optronic equipment for reconnaissance and fire control, acoustic equipment, meteorological, oceanographic, geological and geodetic equipment. Moreover, it is in charge of the protection of armoured vehicles, crew protection and camp protection.

WIS, the Bundeswehr Research Institute for Protective Technologies and CBRN Protection in Munster, is the national centre of competence regarding CBRN and fire

clothing and personal equipment of Bundeswehr military personnel, giving inputs based on its technical expertise.

The **Naval Arsenal,** another subordinate agency of BAAINBw ensures maintenance and repair work for naval ships and boats. Conducting maintenance measures as well as planning and implementing technical modifications to the naval systems are core tasks of the Naval Arsenal. Furthermore, the Naval Arsenal uses its capacities to support Navy missions in all waters all over the world. The Naval Arsenal's operations mainly focus on maintenance for the units stationed in the Baltic including the land facilities located there.

The **Bundeswehr IT Center,** with offices in Euskirchen, Munster, Rheinbach, Münster and Ulm, is responsible for tasks of IT security, system integration, project support and tasks related to field trials. Furthermore, it provides pooled capabilities of cyber defence within the Bundeswehr in the form of the Computer Emergency Response Team (CERTBw), which acts as a central instrument for monitoring, maintaining and restoring IT security within the Bundeswehr IT system.

The **German Liaison Office for Defense Materiel, USA/Canada, based in Reston, Virginia, represents the** German interests

(Photo: WIWeB)

Compliance test at laboratory scale – thermo-physiologic hand and foot models for thermal emission simulation at WIWeB

in matters of defence technology or armaments when dealing with US or Canadian government agencies or industry.

Summary

The aim of all activities of the BAAINBw agencies is to ensure that the defence materiel handed over to the Bundeswehr military personnel is both safe and efficient. In addition, they provide expert support to the armed forces during the in-service phase of the systems. In doing so, these agencies make use of a unique infrastructure with state-of-the-art measuring equipment, which has been adapted to the specific requirements and optimised over the years. The wide scope of demanding tasks is fulfilled by highly specialised engineers and scientists of various disciplines and highly skilled technicians working at these agencies. Thus, the Bundeswehr Technical Centers and the other technical agencies of the BAAINBw organisation are highly modern research and testing sites marked by a high level of specialist expertise, which enjoy an excellent reputation, both nationally and internationally. ■

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