

Update on the Equipment of the Medical Service

The Bundeswehr Medical Service is led and commanded by the Central Medical Service Staff of the Bundeswehr at the Federal Ministry of Defence. The Surgeon General, Bundeswehr, who is responsible to the Chief of Defence, who has the overall planning responsibility for the armed forces, and bears the materiel responsibility for the medical equipment, heads it.

The Bundeswehr Medical Office is a Major Command Authority and Functional Office of the Central Medical Service. It bears, inter alia, the responsibility in the fields of armament and use and further development of the equipment of the medical service in all service and organizational areas. In this function it assists the Central Medical Service Staff within the scope of its area of responsibility in the development and realization of the overall concept of military defence by taking special account of the medical mission in routine duties at home and in operations abroad; in particular, this includes the following:

- Bundeswehr planning
- Advance and improvement of the Bundeswehr Medical Service
- Operability of the Medical Service by specification of the capabilities required for the accomplishment of the mission
- Analysis of the capabilities of the Bundeswehr Medical Service and determination of requirements to be derived from that (personnel and materiel allowance) as well as
- Definition and prioritization of the requirements outline established for the area of the materiel developer/system procurement activity.

The Concept of the Bundeswehr (CoB) and the Directive of the Chief of Defence, for the Further Development of the Armed Forces, which is based on the Defence Policy Guidelines (DPG), were implemented in the Central Medical Service by the "Directive for the Further Development of the Central Medical Service of the Bundeswehr" with the aim of setting concrete standards and targets of action for the organizational area. In practice this means that the medical troops and the medical facilities of the Bundeswehr Medical Service will be equipped with just that materiel which is absolutely needed for the accomplishment of the mission and which is exclusively based on the predetermined capability spectrum for an effective and efficient support of the troops in all mission options.

Capability analysis, requirements determination, and realization of medical materiel/equipment projects are performed and implemented according to the procedural provisions of the Customer Product Management (CPM). This procedure was introduced into the Bun-

deswehr in 2001 with the objective to minimize in principle the development periods, the costs, and the financial risks of new developments. In respect to the overall planning responsibility of the Chief of Defence, there is always a system capability requirement at the beginning of the CPM in which the capability situation of the Bundeswehr is explained and substantiated. A central statement here is the identification of the "capability gap" of the Bundeswehr, which is to be closed in comparison with the desired and established capability.

When the requirement has been acknowledged in principle and organization-wide in the system pool of the Bundeswehr by the responsible Integrated Working Group "Capability Analysis" (IWGCA) as being a materiel capability gap, the procurement will be effected in a four-phase procedure. In that process, the authorized representative of the "officer responsible for the materiel" of the "Armament/Use" Branch of the Bundeswehr Medical Office handles, in fulfillment of the materiel responsibility of the Central Medical Service Staff of the Bundeswehr, the military project elements and prepares planning contributions for both the Bundeswehr Plan and the budget. During the analysis phase he is in charge of the project-related Study and Working Group "Analysis Phase" (SWGPA), and during the project and introduction phase he collaborates with project-related working groups that are headed by the project manager in the Federal Office of Defence Technology and Procurement.

Sequence of the Phases

In the analysis phase, the user describes his Functional Requirements for new defence materiel. With the phase document "Final Functional Requirement" the responsibility changes over to the civilian side and the project manager at the Federal Office of Defence Technology and Procurement examines in a project-planning phase how a potential realization risk in the dimensions of time, technology, and budgetary funds can be minimized. In the introductory phase the conclusion of the contract for the



Medical Staff at Work.

Graphics/Photos: Author

purchase of the product is effected under his responsibility, with the armaments branch of the respective office giving advice, if necessary. In the final service phase the finished product is delivered to the military user and kept operationally ready by the manager responsible for the service life up until its phase-out. The individual phases are terminated by phase documents/decisions/reports.

This procedure is also to be used for the procurement of medical materiel. The CPM procedure allows combining individual phases, because most of the materiel acquired within the scope of procurements made by the Medical Service of the Bundeswehr are commercial products or medical equipment with a low realization risk. This makes it possible to achieve a considerable gain in time and a reduction of the costs of the procedures.

The equipment process in the Bundeswehr Medical Service is executed under the Bundeswehr Medical Service's maxim to protect, preserve, and restore the health of the servicewomen and servicemen. The military personnel employed in Bundeswehr missions abroad must be provided medical support in a way that the treatment fulfills the quality standard required in Germany.

Medical materiel does not only comprise medicine and bandaging material, but also medical products which include the entire medical equipment of the Bundeswehr hospitals and medical facilities in basic operations at home and in missions. To be additionally subsumed here is the equipment that serves the medical support of the soldiers in ground vehicles, ships, and aircraft as well as the equipment of the sci-

entific institutes of the Bundeswehr Medical Service. In special consideration of the mission task, it is necessary to realize the development and procurement of efficient defence materiel, which allows – independent of the environment – to perform the medical task in the full range of the medical and scientific sub-areas at the state of the art of science and technology.

Particularities in the Equipment of the Medical Service

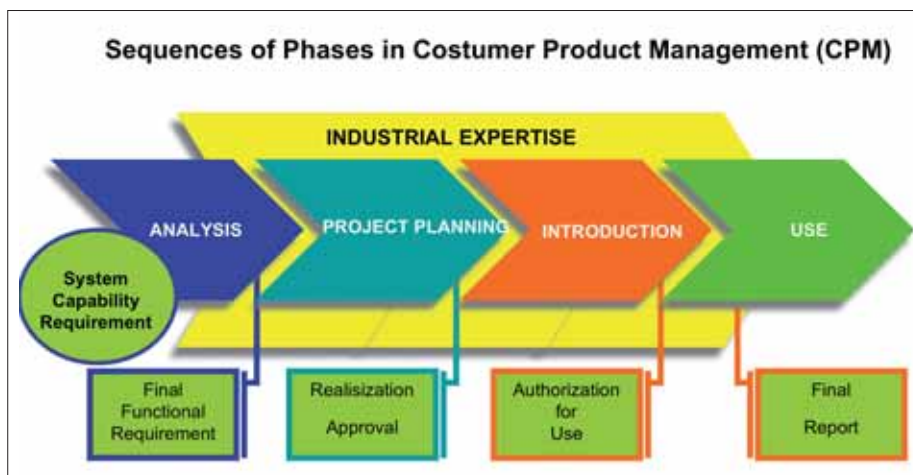
The Medical Service of the Bundeswehr requires equipment which, on the one hand, fulfills the technical requirements of the basic duties at home in medical facilities (such as medical centers, specialty medical centers, Bundeswehr hospitals) and of the necessary placement on the health market, but which, on the other hand, can be used within the scope of missions in the most different regions of the world. The facilities in the basic operations at home are training facilities for the employment in missions. In respect to the legal parameters of medical products and an optimization of the training of medical personnel, the “Armament/Use” Branch of the Medical Office pays particular heed to having – as far as this is possible – standard equipment available on all treatment levels.

Within the scope of the shifting in the change of the security situation and the international commitments in the UN, NATO, and the EU, the mission of the Bundeswehr has become very different. As a consequence, the medical equipment had to be constantly adapted, too. The latest developments in the medical equipment are described in the following.

Vehicles

As for the medical equipment allowance of ambulances it is intended to make it possible that they can be employed both for the Mobile Emergency Physician Teams and the Medical Teams with Rescue Paramedics, i.e. without accompaniment of a physician. The respective appliances in the installation kit for the vehicle would be identical. The medical products for a Medical Team introduced in the vehicle must be suited to project the following capabilities: shock therapy, keeping the respiratory passages free by suction devices, defibrillation, doses of oxygen, manual ventilation, monitoring of vital functions, fixation and correct resting in case of spine and pelvic injuries, tracheal intubations, prevention of heat loss.

Should the vehicle be employed for a Mobile Emergency Physician Team, additional medical products would have to be introduced which supplement the performance spectrum as follows: intubations, ensuring ventilation by means of a respirator, restoring of vital functions (respiration, cardiovascular system), program-controlled application of medicaments by means of infusion and injection pump, respectively.



Medical Equipment for Mobile Emergency Physician Teams, Truck, Medium-size, Protected

The medical equipment “truck, medium-size, protected, for Mobile Emergency Physician Teams”, on the YAK carrier vehicle (“Rheinmetall Landsysteme” Company, Kassel) intended for qualified medical evacuations has already been delivered to the Bundeswehr Medical Service and is now in service in the ISAF area of operations in Afghanistan. The cross-country 6x6 truck is powered by a 184 kW (242 HP with 2,400 to 2,500 revolutions/minute; piston displacement: 5,883 ccm) drive unit with 5-gear automatic transmission. It has ballistic protection, and integrated shielding against mines and IEDs as well as NBC protection. The total weight of the vehicle is 13.5 tons, the payload is 5.5 tons. The YAK, as a carrier vehicle for various capabilities, fulfills in particular the operational requirements in respect to compactness and agility, armor against small arms and mine protection, quick deployability, protection and freedom of movement in narrowly built terrain as well as speed and mobility to evade enemy fire.

The vehicle, which is also used by other Services, is equipped with an installation kit “Medical Equipment for Mobile Emergency Physician Teams, truck, medium-size, protected” which ensures a smooth and gentle transport of patients, also by taking account of occupational medicine and ergonomic aspects. One litter and two seated patients, “wounded, traumatized and sick” (WTS) personnel are possible to be transported in this vehicle. This medical equipment allows the qualified primary transport of WTS patients of all serious injury degrees who have received first med-

ical treatment from the location of their injury to a medical facility of the Role 1 and Role 2 performance level. The transport is conducted under continuous live-saving monitoring of the vital functions on the basis of the standards of the “Professional Guideline for the Medical Support of Soldiers of the Bundeswehr in Missions Abroad”. The medical equipment allows the use in both Medical Team and Mobile Emergency Physician Team functions. The medical products are integrated in the installation kit in such a way that they can be released from their mounting supports without using any tools. The installation kit of the medical equipment has already proved to be very worthwhile and useful in missions.

Heavy Protected Ambulance on BOXER ATV Platform

In addition to stabilization missions, the Bundeswehr will be increasingly integrated in operations of high intensity. Achieving effect in the area of operations requires high tactical mobility and effectiveness with concomitant threat-related protection of key capabilities. The medical troops employed in such operations must therefore dispose especially of protected vehicles with a protection level and mobility commensurable with the heavy mechanized



Medical Equipment of Mobile Emergency Physician Team with Medium-size Truck, Protected, on YAK Carrier Vehicle.

forces to be supplied. With the medical mission module on the platform of the BOXER armored transport vehicle (ATV) (“Kraus-Maffei Wegmann” Company, Munich) there will be a transport means for casualty evacuation available in 2010/2011 which meets equally the demands established in respect to the technical medical requirements, the communications and command capability, the tactical mobility, and the protection against direct combat effects. It is equipped with respective command control and IT means. The vehicle is steered and controlled by use of an optical commandant aid.

The different installation kit versions allow the qualified casualty transport of three wounded personnel in seated positions and of two litter patients or seven seated wounded or three litter patients or one litter patient with accessibility to the head (cranial wounds) and lateral areas. The vehicle disposes of ballistic protection, an integrated shielding against mines and IEDs, and NBC protection. The “Medical Equipment, protected, BOXER ATV” was integrated in the mission module in comfortable and spacious dimensions.

EAGLE IV Command and Multifunction Vehicle

By the end of 2010 the EAGLE IV (“MO-WAG” Company, Kreuzlingen TG, Switzerland) will supplement the spectrum of the Class 2 protected command and multifunction vehicles in the “Mobile Emergency Physician Team (MEPT)” variant. In this vehicle, the MEPT medical equipment is integrated in a very confined space and all capability are implemented in the manner required for the qualified primary transport of wounded, traumatized, and sick personnel. Both medical personnel and patients are transported in a ballistically protected compartment with integrated protection against mines and IEDs. By taking up different seating positions, the rescue assistant acts in the roles of a co-driver and medical assistant.

Medical Radiology in Missions/ Aboard Ships of the Navy

The medical equipment allowance for radiology in missions on Treatment Levels 2 and 3 as well as in fixed infrastructure in missions has been and will be decisively improved by the delivery of mobile digital X-ray imaging scopes in 2009 and 2010. With the “Mobilette XP DIGITAL” (“Siemens” Company, Erlangen) there will be an efficient systems available for mobile x-ray examinations which ensures the performance of a qualified x-ray service in the radiological functional areas of the Modular Medical Facilities (MMF), the Naval Rescue Coordination Center (NRCC), and the medical facilities in fixed infrastructure in missions. The system is available in the radiological area, at patients’ beds or in other functional areas. The x-ray pictures are available on a high-resolution flat screen in no time. Respective inter-



Heavy, Protected Ambulance on BOXER ATV Platform.

faces allow the transmission of the pictures by means of teleradiology for the purpose of seeking a “second opinion” advice from back home in Germany. The original data of the x-ray pictures in DICOM format can be made available for a Picture Archiving Communication System (PACS). In a system-inherent memory it is possible to store up to 3,000 pictures.

Digital radiology by means of the “ATX QUANTpower 400 DR (“Atomed x-ray” Company, Riesa) was projected for the employment in the airborne rescue center. This device is a mobile x-ray system for application on man, which has a total weight of only 75 kg (x-ray beamer with mobile stand); it is easy to transport, effortless to position and thus very flexibly employable. The compact lightweight design allows nevertheless a comfortable working in various conditions. The quality of the x-ray pictures is comparable to those of a sta-

tionary x-ray system and constantly reproducible. Because of the lightweight of the system it is particularly important for an employment with the airborne units.

Airborne Rescue Station – Special Missions

With the “Airborne Rescue Station – Special Missions” a first emergency surgical exploration and medical care of wounded in a mobile conduct of operations of the Specialized Operations Division will be possible to be ensured by taking account of the prevailing operational conditions and the standards set in terms of time, quality and medical service support.

If wounded personnel is not treated by the organic Medical Service of the Army within the scope of the special types of operations of the Specialized Operations Division within the



Protected Class 2 EAGLE IV Command and Multifunction Vehicle.

“golden hour of trauma” (especially with poly-traumatized patients), the compliance with the “golden hour” should be aimed for; according to this recommendation there should not be more than one hour between the arrival of the rescue service and the hand-over to a shock room in a hospital providing maximum medical support. To make it possible for the patient to get primary surgery, the “Airborne Rescue Station – Special Missions” makes a resource-

Ergometry On Board

Ergometric equipment was introduced aboard ships in November 2009. It consists of onboard ergometric measuring devices of the AT-110 XP type (“Schiller Medizintechnik” Company, Otobrunn) which allow to perform examinations of the type occupational health physicians do as well as to give expert opinions in status matters or to examine sailors aboard the fleet units with a medical officer on board in respect to their fitness for sea duty service during the days at sea. The bicycle ergometers are particularly equipped to allow the recording and interpreting of a 12-channel resting electrocardiogram, an electrocardiogram after effort, and of spirometry data.

Oxygen Manufacture in Missions

The availability of sufficient quantities of oxygen is of decisive importance for the treatment of traumatized, wounded and sick personnel. Against the

background of possible difficulties in the logistic chain and the poor supplyability of this medicament within the scope of Host Nation Support, the Medical Service of the Bundeswehr has decided to produce oxygen in missions on its own. Based on the experiences gained with respective production units in the Naval Rescue Coordination Centers on the combat support ships of the Navy or in the fixed infrastructures of the Mazar-i-Sharif Field Hospital and the Kunduz Rescue Center, respective

production facilities in container/tent combinations are now being introduced. Here, production units (“Stephan” Company, Gackebach/Westerwald) are introduced in containers, which produce oxygen in accordance with the molecular sieve procedure with a degree of purity of 93 percent. Following the production it is filled in compressed gas bottles for the purpose of supporting the troops in the area of operations. Interoperability with other nations is ensured by respective adaptations.

Regeneration in Missions

For the norm-conform operation of field hospitals the reconditioning of instruments and medical products is attached great importance. A lack of sterile products can be the limiting factor for the medical mission. The Bundeswehr is presently a world leader in the field of sterilization and disinfections in missions. According to the recommendations of the “Robert-Koch-Institute (RKI), Berlin” and the Federal Institute for Medicaments and Medical Products, the Bundeswehr has established a Central Sterile Commodity Supply Facility in close coordination with the industry. With regard to the technical and hygienic standards in the regeneration of medical products, this plant also meets all the legal parametric conditions of the Federal Republic of Germany.

According to the technical standards, the sterilization unit of the field hospital, which was delivered by the “HP Medizintechnik” Company, Oberschleissheim, has a pure and impure side. A well-differentiated air management prevents germs and dust from penetrating into the pure area. A reverse osmosis plant ensures the water supply and guarantees a safe operation of the automatic purifiers and the sterilizers. Room configuration, gating technology for per-



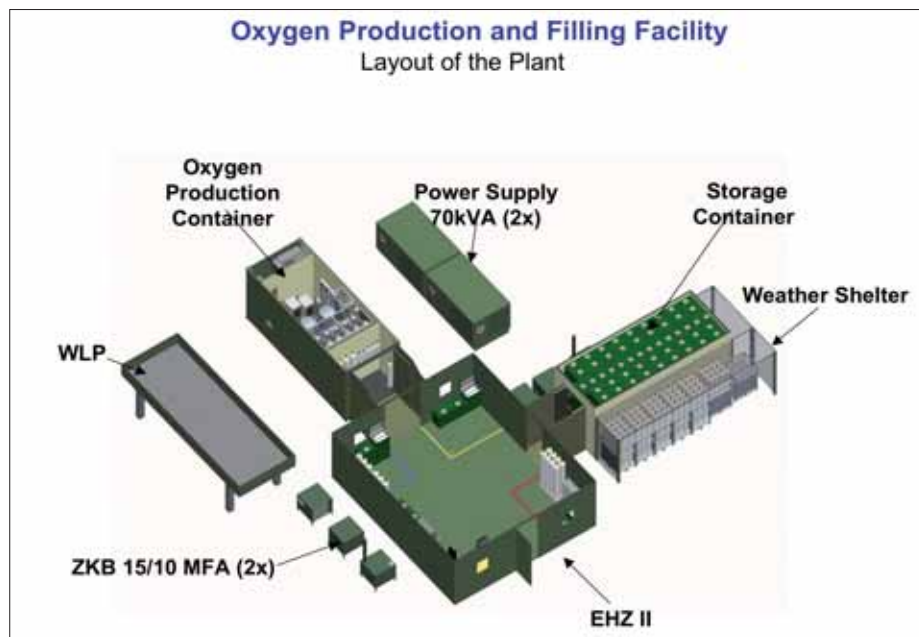
Digital Radiology with ATX QUANTpower400 DR.

limited Damage Surgery Control (rDCS) possible with the aim of supporting life, limb, and functions. This medical facility is capable of administering individual emergency surgical treatment like hemostasis, decompression of intracranial bleeding, care of intestinal injuries, and the stabilization of fractures.

Traumatherapy in Missions by Means of Vacuum Sealing

To improve wound care in missions it is intended to introduce in 2010 the V.A.C. Freedom System (“KCI Medizinprodukte” Company, Wiesbaden) for vacuum sealing complicated and extensive wounds that are not possible to be sutured within the scope of primary treatment. In the application of the wound-care system to be introduced, the wound is filled with porous polyvinyl alcohol (PVA) or polyurethane (PUR) foam, sealed with a breathable, water-repellent polyurethane foil and a negative pressure is delivered by means of a vacuum pressure pump. By this procedure of hermetic and sterile sealing, a secondary contamination is avoided and the transport under aseptic conditions will be possible even with complicated wounds. In some cases only the vacuum seal allows a time-optimal and technically correct return of the patient to the home country. With the introduction of this system, wounded and traumatized personnel in the areas of deployment will be provided medical care, which produces clearly better treatment results in comparison with conventional therapy options.

Oxygen Production and Filling Facility Layout of the Plant



Oxygen Supply

sonnel and material, working surfaces and floor space correspond to today's state of technology and comply with the regulations for the standards set for such facilities. Pass window thermoisinfectors ("Miele" Company, Guetersloh) and special endoscope cleaners ("Olympus" Company, Hamburg) characterize the high technical standard. The reconditioning processes are validated and safely reproducible. For the quality management all workstations are connected to a network so that the entire process is digitally recorded and documented in real time by a documentation system. The reconditioning of each individual instrument set is batch wise reproducible. Archiving is effected in signed and manipulation-proof PDF files and archives.

Personal Medical Equipment

The deployment of soldiers – especially in the parametric conditions with ISAF and KFOR – required a basic revision of the individual protective equipment of the soldier. As a result of the revision made by the, "Armament/Use" Branch at the Bundeswehr Medical Office it can be stated that the new individual protective gear comprises, in addition to a tourniquet, a respiratory protective foil with FFP 3 filters, special highly elastic compression bandages, hemostatic agents, thermo blankets, gloves as well as pain-relieving and antibiotic drugs.

Clinical Equipment

The already high-quality and modern equipment in the Bundeswehr hospitals in Koblenz, Ulm, Berlin, Hamburg, and Westerstede will be further extended in the years from 2009 to 2011. Planned for the area of nuclear medicine is the procurement of a "Symbia T 6 SPECT CT" ("Siemens" Company, Erlangen). This device is the combination of a twin detector SPECT with a variable detector angle with a 6-line CT scanner for quick and exact attenuation correction, precise localization and special CT applications in the fields of cardiology, oncology, and neurology. In addition, an operation unit with integrated magnetic resonance tomo-

graphs will be available at the Bundeswehr hospital in Ulm in the medium term, i.e. in line with the construction progress, in order to be able to perform neuro-surgical operations of the cranium, the cerebral tissue, the intracranial region, the vertebral column, and the peripheral nerves under interoperational magnetic resonance tomographic control. This operation unit serves especially the training of neurosurgeons for their employment in missions, as the types of traumatic injuries occurring there require in a steadily increasing measure the neurosurgical intervention.

As for the field of oral, maxillary, and facial surgery a 3-D volume tomograph will be available in 2010 which will decisively improve the implant planning and the augmentation in the oral implantology. This procedure, which visualizes implant planning and augmentative measures in the planning stage already, is of basic importance for the quick restoration of the employment capacity of the soldiers.

Laboratory Equipment

For the researching institutes of the Bundeswehr Medical Service, there will be additional improvements of the work prospects within the scope of the toxicological and pharmacological basic research in 2009/2010 resulting from the procurement of basis-pharmacological measuring positions or high-pressure liquid chromatographs with downstream mass spectrometers. The liquid chromatography with mass spectrometry is of particular importance for analyzing agent metabolites in biomedical sample material. These explorations are important for the armed forces within the scope of the development of diagnostics and therapies in cases of intoxication by NBC agents.

Training

It is vital for the Bundeswehr Medical Service that the training in especially the fields of emergency medicine and first-aid measures is optimally arranged. To this end, a comprehensive patient simulation facility for the training of emergency physicians and rescue assistants has been made available in 2009.

A Look into the Future

The mission spectrum of the Bundeswehr Medical Service requires a



Training in the Medical Service.

Photo: ES-Archiv

constant revision of the available equipment and adaptation to the parametric conditions in missions. As for the present equipment, the Bundeswehr Medical Office, the technical bodies, and the Federal Office of Defence Technology and Procurement heeded the stringent nature in the product line to allow the legally stipulated training effort to be optimized. In the process of the modernization of the equipment the criteria for achieving high efficiency concomitantly with light equipment weights and reduced volumes will become significant, especially for missions and operations. A start was made with the introduction of hand-held I-Stat blood gas analyzers or respective respirators. Additional steps will be taken here within the scope of the imaging procedures, especially in the field of ultrasonography.

The armament process, the technical development, and the regeneration of the medical equipment are implemented by the responsible authorities with due regard to the medical requirements in terms of quality and quantity and in constant consideration of the economy and efficiency. Medical technology is developing tremendously fast, and in context with the procedural guidelines on the procurement activities of the Bundeswehr it is thus of decisive importance that the state of technology continues to be the basic yardstick for the acquisitions. ■

By Col (GE MS) Dr. Claus-Michael Lommer, Bundeswehr Medical Office.



Clinical Reconditioning of Instruments and Medical Products.