

Protected Ground Vehicles

All measures of the armed forces, including those of important armament projects, are assigned to the essential objective of the transformation of the Bundeswehr, namely to consistently gear the armed forces to the most likely missions by improving their operability at the same time. The capabilities, which the ground forces and mainly the Army, primarily aim at are the protection and the effect in operations. Both aspects are directly connected and interactive. This guarantees the successful effectiveness and robustness of the employed forces. Prerequisites for these capabilities are the ability to conduct precise reconnaissance as well as a superior command and control effectiveness. Finally, the armed forces must be capable of taking part in diverse actions for network-enabled operations. The goal is to achieve superiority in operations through the interactive pool of “command control – reconnaissance – effect” on the basis of a modern communication structure. Information superiority and command superiority are to be successfully translated into superiority in efficiency and effectiveness. In this context, the protection factor has gained in importance, too.

In the current multifaceted missions, the German soldiers are exposed to multiple, partly novel threats. The participation in worldwide missions and operations requires the accomplishment of tasks in geographic and cultural conditions, which are much different than those at home. Many and diverse types of threat, ranging from the fight against a militarily organized adversary up to hardly foreseeable terrorist attacks, must be met. Special exposures and risks arise from attacks with improvised explosive devices (IED) and those of suicide bombers. Other than in an engagement in a “well-regulated theater of war” against a militarily organized adversary, the threat posed against operating forces takes now place spatially and temporally all around and in the midst of the population to be supported which, however, is mostly well disposed towards the soldiers. All that requires the protection of all friendly forces in the best possible and cautionary way. This necessity becomes evident by the incidents in Afghanistan increasingly occurring since 2006, including the cowardly attacks against German soldiers resulting in death in the supposedly uneventful and quiet North. So far, about 30 German soldiers have lost their lives in the ISAF mission; more than half of them were killed by insidious attacks like those in fall 2008. In their acting the cowardly murderers showed no consideration for the civilian population and even didn't care about the children.

The requirement to improve the protection becomes also evident when bearing in mind



German Military on ISAF Mission in Afghanistan.

Picture: IMZ

that only a small number of the vehicles employed in operations is actually “protected”. In the Army, only about a third of the vehicles are protected and in the ISAF forces with their 750 vehicles it's about half the number, which is equipped with protective shielding. The DINGO 1 and the specialized forces combat vehicle MUNGO as well as the WIESEL 2 armored mortar, and, since 2006 with ISAF, also the DINGO 2 all-round protected transport vehicle have, aside from individual armored combat vehicles of the Army, proven well in the missions for quite some time. However, many German soldiers still have to carry out their tasks in wheeled vehicles without any protection or with just modular protective equipment, i.e. insufficient protection. Against the background of the IED attacks in October 2008, the Federal Minister of Defence, Dr. Jung, has decided that in future only protected vehicles are to be used for missions in the area of deployment.

Another reason to dispatch soldiers maximally protected to the missions are the respective psychological and political effects and repercussions of attacks and losses. The perception of attacks, worldwide up to the families back home and in the society, must be taken into consideration, if one wants to successfully come through long-standing missions of this type. A complete protection for all mission situations is not possible and this is not only because the soldiers on operation have also to act when dismounted from the vehicle, e.g. in establishing contact with chiefs of tribes or the civilian pop-

ulation. Nation building and reconstruction cannot be achieved by soldiers sitting high up on quickly passing armored vehicles, but mostly in direct contact only. It is especially for that reason, however, why the protection of the own soldiers on missions with all the suitable measures and means must be part of the political principal's and military leader's duty in respect to care and support.

One could think, however, that at least the Army has enough armored tactical and combat vehicles to be able to successfully conduct the current missions. But firstly, the Army is not alone in these missions, even though it provides 50 percent or more of the troops. And required are many types of different vehicles and not only combat vehicles. In addition to the aspect of protection, there is another point to be considered. Depending on mission and situation, effect or robustness is nowadays achieved by different measures and also vehicles. For example, the existing armored vehicles of the Army are not available or suited for each individual case of engagement. Reasons for that in the past years was the required quick airlift deployment over long distances or the political reservations and hesitations, respectively, with regard to the employment of armored vehicles (battle tanks, armored infantry fighting vehicles) in peacekeeping operations. Also, experiences gained in missions revealed that a consistent and simultaneously confidence-inspiring approach to the parties to the conflict and the civilian population with smaller, less

“warlike” vehicles was much more promising. Moreover, terrain conditions, especially mountainous and hilly regions as well as villages in the Balkans and in Afghanistan, quickly showed the limits for massive combat vehicles.

In these conditions the Bundeswehr basic objective is to guarantee the forces in an area of deployment the same protection wherever possible. Here, protection doesn’t just mean to install a lot of “heavy sheet metal plates” in the vehicles. Protection encompasses a whole package of preventive, active, and passive measures ranging from training via operational principles and procedures up to the equipment. Specific operational procedures and methods of cooperation, e.g. in a convoy, have to be practiced in basic training in Germany already, and

sions. Additional protection can be achieved by the use of measures to counter IEDs. Means for their detection are already effectively employed in the missions; and the destruction of IEDs is also to become possible in future.

The protection of vehicle platforms is thus only an element in connection with this subject, even though a really significant one. The criteria for the procurement of protected vehicles were modified in view of the changed conditions of operations. Since the beginning of Bundeswehr missions abroad, additional suitable vehicles have been procured aside from the existing ones, which hitherto was often effected with the “Immediate Mission Requirements” procedure. With the beginning of the transformation of the armed forces, but also as

the end, however, the functionality of the vehicle comes first, because without it an accomplishment of the mission will not be possible. To reach a good compromise between the three requirements and other necessities and desires of the troops is anything but easy and makes great demands on both the procurement activity (Directorate General of Armaments and subordinate agencies) and the arms industry.

The capabilities required in the different missions cannot be covered by means of just a few vehicle platforms. For that reason it is intended to procure different types of vehicles, which cover the necessary functionalities on a broad basis. Another goal is to limit as far as possible the number of types of different platforms. By combining vehicle classes or vehicle families it will be possible to limit costs and expenditures for procurement, operation, supply, and training. It was against this background that the system capability requirements “capability for protected tactical mobility within the scope of ground-based operations” and “road transport in operations” were worked out including the establishment of the targeted requirements. The final functional requirements for protected vehicles of the Bundeswehr were derived from these basic documents. Here it is about two areas: the “protected command and multi-function vehicles” (PCMV) and the “protected transport vehicles” (PTV). In addition, there is a requirement for “protected special vehicles” (PSV) which are often used in the support forces.

An important question concerns the number of protected vehicles needed. The replacement of all non-protected vehicles available according to TO&E by protected PCMV/PTV/PSV is not realizable. Therefore, a mission-related requirement was conceptually determined. All response forces and their support forces as well as a fifth of the stabilization forces are to be equipped with protected vehicles. In the derivation, additional vehicles for the stabilization forces were taken into consideration for the preparation of the follow-on contingent aside from the demand for the actual mission. This results in a “mission-oriented requirement” of about 19,500 protected vehicles for the Bundeswehr. This is still a very high number. Therefore, a so-called corridor of already planned and still available numbers of PCMV/PTV was provided for in the Bundeswehr Plan, which will be tackled by 2015 as a first major approach to the protection of platforms with a prospect of implementation. This corridor comprises about 5,500 PCMV/PTV, i.e. approx. 28 percent of the requirement. Combat vehicles are not included in these numbers. With regard to the necessities in respect to care and support, the numbers fall short of expectations, especially when one can see that the provision is not effected “immediately”, but over a period of about six to seven years. Here, it might be worthwhile to recall the lofty statements of some politically responsible figures who in direct connection with attacks against



Employment in Narrow Villages in Afghanistan.

Picture: FMoD/Houben

especially in mission-preparatory training prior to a concrete employment in operations. When it is realized – as it was learned with the recent attacks – that not only individual attacks, but tactically designed ambushes with multiple attacks and fire fights of adversaries are set and launched, it will be necessary to prepare the own tactics for such traps. Here it would be necessary, for instance, to have such sort of procedures again that are applied in traditional ambush fighting. The use of unmanned land means can also protect forces and help avoid losses of personnel. This has been taken into consideration and is going to play a role in future, as it could be observed with the European Land Robot Trials in Hammelburg in early July 2008. The enhancement of the personal survivability is of great significance for the soldiers and the operational capability of the forces. The equipment programs “Infantryman of the Future” and “Soldier in Operations” stand for that and have, in part, already proven well in mis-

a consequence of the prolonged missions it was realized that the ad hoc procurement of individual protected vehicles in limited numbers and related to specific missions could be a first approach only. For that reason, a basic conceptual approach was chosen in order to comprehensively increase the protection of own forces on missions by fielding suitable “protected wheeled vehicles”.

The term “protected vehicles” indicates already that conventional combat and armed vehicles are not to be understood by them, although these can also play quite a proportionate role in the present stabilization operations. Meant are wheeled vehicles which are to be equipped with sufficient protection for the current and future missions. In this context it is important that the factor “protection” does not “prevail over” other significant criteria like mobility and functionality or effect of the vehicles and their crews. The protection should be of high standard, but the tactical mobility, too. In



US MRAP (Mine Resistance Ambush Protected Program) Vehicle.

Picture: Pentagon

members of the Bundeswehr demand an enhancement of the protection of “our servicewomen and servicemen”. Right so, but then the investment share in the defence budget ought to be increased and the priorities in that budget are to be set differently. The fact that protected vehicles can provide good protection was clearly proven by the attacks against mounted soldiers of our armed forces who mostly suffered only minor personal injuries.

Our American allies once again demonstrated that it is possible to take speedy remedial action by way of a concerted approach and respective financial commitment. From the experiences gained in Iraq and Afghanistan they realized the necessity to quickly procure protected wheeled vehicles for their operating forces within the scope of an instantaneous program. Aside from that, a strategic and more future-oriented similar program is still being worked on. In the “Mine Resistant Ambush Protected (MRAP) Vehicles” project, 26 different types were selected in the three classes “command and control, reconnaissance, combat in built-up areas”, “escort vehicles and conversion kit carriers” as well as “special vehicles”. Five different producers introduced these vehicles with extensive market availability within about two years beginning from 2006. Of some 15,000 vehicles a total of more than 12,000 were delivered so far. The financial volume comprises 25 billion US dollars. A speedy and expensive project in which not every one of the vehicles meets all the expectations and tactical requirements (e.g. mobility of some types in mountainous terrain), but which makes protection for the own soldiers available under near operational conditions and which has a considerable positive impact on the sustainability and the morale of the troops. And,

by the way, this also results in a negative effect on the adversaries’ prospects of success and their standing and reputation in the population and beyond. The US armed forces were able to reduce the losses caused through IEDs by 90 percent. One can hear the murmur – “yes, the Americans”. But nevertheless, with some political will it would be possible to provide protected vehicles – as described above – in a faster and more comprehensive way to the operating forces of the Bundeswehr.

Protected Command and Multifunctional Vehicles (PCMV)

The non-protected M 113, the 2-ton trucks as well as the non-protected or insufficiently protected small vehicles, like the 0.5-ton WOLF truck, are to be replaced by the PCMV. The segment of the PCMV was divided into four differentiated classes, which differ above all in the air transportability of the vehicles. Additional important criteria are ballistic and mine protection, payload, and active volume. The protection against IEDs was subsequently integrated due to changes in the threat situation resulting from experiences gained in Afghanistan. Other requirements apply to all classes, for example NBC protection, self-defence under protection and armament stations or standards regarding command capability, mobility, and ranges. Since 2006, automotive engineering and function-related studies by the Bundeswehr are under way with a different number of demonstration units in the four PCMV classes. The goal was to complete these in 2007 in order to quickly start with the pro-

cedures as of 2008. A decisive selection criterion for all PCMV is a speedy procurement of the required number of units from the market for the current missions of the armed forces. In the PCMV classes 2 and 3 it was possible to complete the studies in due time and to make the respective selection decisions. The two other classes still lag behind.

PCMV 1

Protected small vehicles of this class are to serve as command and control vehicles, conversion kit carriers or as small vehicles for transports with a payload of one ton. Essential feature of the Class 1 vehicles is the possibility for them to be airlifted in CH-53 helicopters with a maximum of five tons. These vehicles are to provide protection against at least antipersonnel mines and assault rifles. Competitively tested as demonstration vehicles

were the types MUNGO in the variant 3 (large capacity) as conversion kit carrier of the Krauss-Maffei Wegmann (KMW) company, the GAVIAL of Rheinmetall Landsysteme (RLS) on Panhard Auverland AVL basis, the FRETTCHEM – the military version of the VW TOUAREG – as well as the SURVIVOR of the Austrian ACS/Achleitner company on Daimler chassis.

The results of the test were rather disillusioning. None of the vehicles was found to be totally suitable. Due to numerous malfunctions and breakdowns it was not possible to complete a first trial round. The FRETTCHEM has meanwhile been withdrawn by VW. In the first six months of 2008 it was intended to run another test among the remaining three types with adapted goals and objectives and to make the respective selection. It was realized that the fulfillment of the standards given was not possible to be accommodated with the important criterion of air transportability in CH-53 helicopters. The trials were discontinued. With a new approach it is now tried to find suitable vehicles in the PCMV 1 class. For that purpose, the class was subdivided into two type segments: smaller vehicles that are air transportable in CH-53 helicopters and those which are not suited for that, but which fulfill the other criteria – perhaps even better. This takes account of the fact that not all vehicles of this class need to be air portable by helicopters. On the other hand, concessions (protection, conversion kits, etc.) were made with the small vehicles mentioned first in order to be able to keep to the weight limits for this type of air transport. It is certain, however, that armament stations are no longer required.

It can be assumed that the above-mentioned remaining three companies will now compete

PCMV 1



GAVIAL



MUNGO



SURVIVOR

Vehicles of PCMV 1 Class.

Graphic: FMoD

in a new trial with respectively adapted versions. Whether or not other models will immediately appear on the scene is rather doubtful. The KMW and RLS companies plan to market a new vehicle type, the "Armored Multi Purpose Vehicle" (AMPV), in the medium term, however. These small vehicles with a weight of 5 to 9 tons in two type series are intended for the PCMV 1/2 classes. The whole vehicle family is based on standardized construction plans and technologies. Innovative, high-strength protection technologies, a robust high-performance chassis based on the construction principles of the ATV BOXER program, and a 3.2 liter diesel engine with power efficiency of approximately 200 kW are the characteristic features of the AMPVs. Both series are planned to also include patrol variants. As for the lighter AMPV1, a special patrol version is planned that will be suitable for the transport in CH-53 helicopters. First prototypes are said to be available in 2009 and first deliveries are expected as of 2011. The AMPV2 could thus appear as a competitive model in the PCMV 2 class in follow-on procurements. In the PCMV 1 class, the demonstration tests with the participating models as well as the selection decision are now to be effected in 2009. The delivery of first vehicles is assumed to begin as of 2010, i.e. with a time delay of one to two years.

PCMV 4

New models and offers in the PCMV 4 class were tackled with a time lag. Originally, only the armored

transport vehicle (ATV) BOXER was planned here. Meanwhile it is no longer considered as a PCMV project. At least in the variant of the Army it is to be regarded as a combat vehicle. Now, there are two vehicles to be chosen from: the WISENT of RLS and the PCMV 4 6x6 (formerly designated GRIZZLY) of the KMW company. The vehicles are to close the gap between DINGO 2/YAK and the ATV BOXER. The essential requirement here is that they should be transportable in the A400M aircraft with a maximum air loading mass of 30 tons.

With a usable volume of more than nine cubic meters, the maximum permitted load is said to be 2 to 4 tons. The NBC, ballistic and IED as well as mine protection is to correspond to Class 3.

It could be claimed that the WISENT is a further development of the YAK. Similar to that, the personnel compartment is accommodated in a multipurpose superstructure, which is quickly exchangeable if required. Depending on the superstructure, the crew will consist of 6 to 14 personnel. With a total weight of 25.5 tons and an engine power of 320 kW it is possible to achieve high mobility on roads and in terrain, speeds of up to 105 km/h, and a cruising range of 700 km. The additional load is 9.5 tons. In the tractor-trailer variant, the trailer weight can be up to 11.5 tons. Air transportability in the A400M transport aircraft is possible; with less protective shielding it is also possible in the C-130 HERCULES. The protective measures for the driver's compartment as well as the armament station and superstructure are also geared to the requirements of the Bundeswehr.

The vehicle of the KMW Company has a payload of more than 4 tons. The engine power of 331 kW generates speeds of up to 90 km/h and a range of 700 km. The safety cell, which is to meet the protection requirements, encloses the interior of the vehicle including the operator's compartment. Engine and gearing are protected against ballistic effects. By means of a modular system it is possible to design different variants relatively easily. In addition to the 6x6 version required by the Bundeswehr the vehicle can also be produced in 4x4 or 8x8 variants. One could say that this vehicles represents

PCMV 4



*GFF 4 6x6
of KMW*

WISENT of RLS



Vehicles of PCMV 4 Class.

Graphic: FMoD

a DINGO plus. Contracts for the demonstration units of the PCMV 4 class were concluded with both KMW and RLS. Studies and tests regarding the requirements in respect to vehicle engineering, protection and integration of conversion kit are under way. The selection decision is planned for early 2009, first procurements as of 2010.

PCMV 2

Against that, the procurements in this class have become reality already. Comparable small vehicles as with the PCMV 1 class, but with a payload of 2 tons belong to the PCMV 2 class. These are not to be transported in CH-53 helicopters, but in the C-160 TRANSALL with two vehicles at a maximum of six tons air loading mass each. These heavier vehicles can be equipped with a better protective shielding, e.g. against assault and sniper rifles 7.62x39 AP (armor piercing) and blast mines. There was a choice between the EAGLE IV of the Swiss MOWAG Company (subsidiary of General Dynamics European Land Combat Systems Group) and the CARACAL of RLS. In July 2007, the EAGLE IV was selected. It has fully met the protection requirements, including those against IEDs, and it has largely fulfilled the functions required. The automotive engineering prerequisites for a series production are given. Although the EAGLE IV has an in-



EAGLE IV.

Picture: MOWAG

creased permitted gross vehicle weight of 8.5 tons, it keeps with its 5.9 tons to the required air loading mass. The usable volume is about 4.5 cubic meters with a payload of 1.8 tons. Power train and chassis correspond to those of the already introduced YAK/DURU III vehi-

cles. The EAGLE IV has a 184 kW diesel engine and a range of 700 km at maximum speeds of 120 km/h. All-wheel drive, tire pressure control system, tires with run-flat rings and some more things are available. As required, ballistic and mine protection have been ensured. A

light armament station is possible to be integrated whose accommodation in the vehicle was also one of the requirements. Up to five personnel can be accommodated as crew.

The numbers of the target equipment of the armed forces in the PCMV 2 class amount to about 5,400 vehicles. The initial allowance comprises some 1,200 vehicles of which about 660 in different variants are to be delivered in a first step by 2015. The first multifunction variants are to be used primarily as operational vehicles for command control and reconnaissance, scouting and liaison as well as for some special tasks. In addition to these, variants with special functions will be procured, too. In the Army, these are e.g. ten EAGLE IV with special equipment for the "KZO" drone system. In early November 2008, the budgetary committee of the German Bundestag (Lower House of Parliament) has resolved to procure the first 198 EAGLE IV especially for the Army and the Joint Support Service (JSS) at a lump-sum price of about 105 million Euros. Included in that were 25 vehicles ordered in advance which are to be delivered to the ISAF mission as of late 2008. The first vehicle was handed over to the troops on 12 November 2008. It is planned to competitively tender the 2nd batch of approximately 430 vehicles by mid 2010 (e.g. AMPV – see above). Irrespective of that, FMoD holds for that number of units an option on the EAGLE IV until the end of 2010, which could alternatively be realized at short notice. The procurement of additional 20 of these vehicles in the variant "light mobile medical officer's team" is to be decided on in the course of the year 2009.

PCMV 3

The PCMV 3 class consists of classic carrier vehicles for conversion kits. Required here is a similar ballistic protection as in Class 2, but an even better mine protection against blast mines. The usable volume is to be bigger than nine cubic meters, the payload higher than two tons. Here, vehicles, which had already been procured in small numbers for Bundeswehr missions, were tested primarily in respect to their suitability for air transportability with a maximum mass of eleven tons. These were the YAK of RLS and the DINGO 2 of KMW. The DINGO was tested in the three versions "short wheelbase", "long wheelbase", and "large capacity".

The DINGO 2 corresponds to a large degree to the already proportionally introduced DINGO 2, a further development of the DINGO 1, which has proven well in the missions abroad since 2000. In comparison with the DINGO 1 the more capable UNIMOG chassis (U 5000) of the Daimler AG produces with 6.08 m a

greater length and 11.8 tons gross vehicle weight and as a result of that also a higher additional load of about 1.5 tons and more space in the interior of the vehicle for up to eight personnel. It can reach maximum speeds of more than 90 km/h with a range of about 1,000 km. The armament with 7.62 mm MG or 40mm grenade machine gun in protected armament stations is optionally selectable. DINGO 2 has presently the best protection in this class against modern small arms, artillery fragments, NBC munitions, and it is equipped with an even more improved antimine shielding. In addition, the vehicle is possible to be transported in common transport aircraft including the A400M. The DINGO 2 has been procured within the scope of the "immediate mission requirements" since almost two years and fielded with both Air Force and Army. The vehicle was thus possible to already prove itself in the missions.

DINGO 2 "short" and "large capacity" differs from the "long" variant in the wheelbase, usable volume and payload. Only the "large ca-

former designation DURO III – have been delivered by RLS in the "mobile medical officer's team" or military police versions and are in use in current operations. The 6x6 multipurpose vehicle of the 12-ton class offers space for ten soldiers or respective mission packages. The multipurpose superstructure is exchangeable and carries two tons with a protected payload. Chassis and multipurpose superstructure can be used separately from each other in independent ways. With an engine performance of 191 kW the vehicles reaches a speed of up to 100 km/h. The YAK, too, is to be equipped with a protected armament station. It has the required NBC, ballistic protection as well as the integrated protection against mines. It can be transported in the C-160 transport aircraft and later also in the A400M. The vehicle can be equipped and used for different functions, e.g. for transport, logistics, medical or explosive ordnance disposal (EOD) purposes. The YAK will be used primarily by the Joint Support Service (JSS) and proportionately in the Army, e.g. with



Vehicles of PCMV 3 Class.

Graphic: FMoD

capacity" DINGO has a protected rear compartment, whereas with the two other types this is flanged on without any shielding as space for material. With about three tons the "short" DINGO 2 has the highest payload, which is due to its low dead weight. The air loading mass is 11 to 11.5 tons with all three types. Latest development is that the "large capacity" DINGO is now to be replaced by the DINGO Pickup variant. All three types are needed in the Bundeswehr for different functions.

The YAK is to complement soft-skinned carrier vehicles of the Bundeswehr and to primarily increase the protection of supporting forces in operations. First vehicles – known under the

the NBC defence corps, the Special Forces command or with the LUNA reconnaissance drone. Furthermore, a total of 120 vehicles of the "mobile medical officer's team" version will be procured in which space is needed for performing the required activities with personnel standing up.

All DINGO 2 variants as well as the YAK are through with their tests and checks. Integration tests were carried out for more than 40 different function variants. The basic DINGO 2 variant for personnel and material transports and some specific variants of the individual organizational areas of the Bundeswehr are currently in the process of delivery. The pro-

curement of 199 “long” DINGO 2 patrol and security vehicles was tackled in advance. The delivery for the three services will be realized by 2009 of which the majority totaling 133 vehicles is going to be fielded with the Army. Formally, this project is placed in the category of the PCMV 3 class project. The YAK is also on the “home stretch” and is to be delivered as of 2009.

Protected Transport Vehicles and Protected Special Vehicles

The Protected Transport Vehicle (PTV) project is another key project for the protection of platforms in missions and operations. Transport tasks in areas of operation can only be successfully carried out, if the tactical mobility is combined with threat-related protection. The protection of the PTVs will include the operator’s compartment, but not the whole platform. In five PTV classes with additional loads of 2 tons, 5 tons, 9 tons, and 15 tons and with the 25-ton semi trailer towing truck it is intended to introduce cross-sectionally usable vehicles as basis of a family, which can be equipped with different conversion kits according to their functional tasks. Such adaptable and modular solutions are particularly cost-effective. The selection of the PTVs is made similarly to the procedures applied with the Protected Special Vehicles (PCMV). The invitation of tenders for the procurement of the demonstration types has been made. The Daimler AG and Iveco companies have delivered their types in the respective classes in the period up to the end of

2008. The tests of the PTVs by the respective official agency will be conducted afterwards. Once the selection decision has been made, the introduction will begin as from 2010.

In addition to the above mentioned protected vehicles it is intended to also procure other protected special vehicles (PSVs). Formally counted among these are the already introduced specialized forces combat vehicle (SFCV) MUNGO and also another variant of this vehicle, the “multipurpose” MUNGO. The latter vehicle (manufacturer is KMW; basic vehicle by Multicar company) is suited for the transport of supplies and containers, but it can, for instance, also be used for NBC and engineer tasks. A self-loading device (500–1,000 kg), dozer blade as well as the high-power hydraulics for attachments make this vehicle employable for independent and multifunction tasks. Other PSVs are, for example, different transport vehicles such as heavy 8x8 road tank trucks, “FSA” special equipment trucks or the Heavy Equipment Transporter 2 with 70 tons, the “TEP 90” which was just introduced, as well as recovery and crane vehicles or digging equipment. All these are planned to be protected at least in the area of the operators, i.e. the operator’s compartment.

The new truck with ancillary equipment (multi “FSA”) will be procured independently of the above-mentioned programs with a first batch of approximately 160 vehicles for the JSS and the Army. First vehicles of the “FSA” type are already in use. It has a protected operator’s compartment with shielded weapon mount as well as armor steel and heavy sheet metal construction, which protects against fire by infantry armor piercing ammunition and against blast mines. Carrier vehicle is a truck of the MAN

Company; the “FSA” variant is manufactured by KMW. The loading device of the HIAB Company makes it possible to transport all introduced load carriers. The vehicles serve as system carriers for MULTI-capable 20-foot/14-ton containers as well as conversion kits and modules for command control and combat service support. The MULTI-FSA vehicle will also transport the new MUCONPERS, protected special containers for the transport of up to 18 personnel.

Additional Protective Measures

Aside from a protected platform the new wheeled vehicles of the Bundeswehr are also to ensure the capability for self-defence under protection. It is therefore intended to make the adaptation of a protected operable armament station possible with all PCMV’s – except for PCMV 1 – and PTVs. A standard interface of mechanical or electronic type for power supply and with control elements is integrated. Depending on the function and task it is possible to integrate different remotely controllable armament stations. The basic armament station is to be equipped with MGs 3/4. The so-called “remotely controllable light armament station” (RCAS) is available in two versions. The RCAS 100 is planned for weapons up to 12.7 caliber MGs; the RLW 200 version for weapons up to 40mm grenade machine guns. It is possible to reach ranges up to 1,000 and 1,500 m, respectively. Night combat capability is provided. At present, the 1st batch of KMW with 230 and 190 RLWs 1/2, respectively, is in the process of delivery. The MG on rotary-ring mount, formerly known from mainly Bundeswehr trucks, is thus history.

Planned as an interim solution until the provision of the equipment for the described PCMV’s and PTVs which, as mentioned before, is going to take longer after all, is the retrofitting of available trucks with more modern “modular fragment protection” (MFP) for the missions and operations. This is to provide better protection especially against mines and IEDs. This additional and also financial expenditure is to be limited by way of a strict selection of the necessary vehicles. These are all to be made available from, inter alia, a vehicle pool for both missions and reserve forces like the NATO Response Force (NRF) and EU Battle Groups (BG). The measures concerned here refer to 2-ton to 10-ton trucks as well as a large number of 0.9-ton WOLF trucks. For 250 vehicles, the program is in progress since 2007.



PTV Vehicles.

Graphic: Army Staff



Remotely Controllable Light Armament Station.

Picture: KMW

The FUCHS armored wheeled transport vehicle (AWTV) of the RLS Company will also be improved to proportionally close the gap until the introduction of a new generation of protected vehicles. The structure requirement in the “New Army” comprises some 600 AWTVs of which about 100 are NBC reconnaissance systems. Currently, about 150 AWTVs are used in the different areas of operation in the Balkans and with ISAF. The FUCHS in its new 1A8 version will get an effective modernization by RLS which will above all include an upgraded protection of the crew against especially mines and IEDs. The Bundeswehr has already contracted a batch of 21 FUCHS vehicles of the new type. First vehicles are already in use with ISAF.

Symposium “Protected Vehicles for Ground Forces”

The Federal Academy of Defence Administration and Technology together with FMoD Armaments Division V and the German Army Sponsor’s Association (Förderkreis Deutsches Heer e.V. (FKH)) held a defence technology symposium as a joint event in Mannheim from 4 to 6 November 2008. The topic “Protected Vehicles for Ground Forces” covered the described problems and met with great interest. Many experts from the armed forces, the defence administration and the armaments domain, from military technology companies, the specialist media as well as members of the FKH e.V. followed the invitation. In the symposium it became evident that, on the one hand, one has chosen the right course with the conceptual approach to procure “protected vehicles”, but that, on the other hand, not all ideas will be possible

to be realized without difficulties. To make use of vehicles available on the market and to quickly introduce them with respective adaptations into the missions is an excellent objective. It is not always possible to meet all requirements of the military user within a short period of time. There is a risk that models whose technology is not fully matured yet will be delivered and acquired which, as a result, will then necessitate additional tests and cause delays. Also addressed were some difficulties in the application of the CPM procedure with regard to the enormous time pressure as well as in the cooperation of the different actors. It became obvious that of the three driving factors “time”, “costs”, and “quality” only two would be possible to be met.

As the costs are more or less established (or are going to rise), solutions can only be achieved by way of quality degradation (something nobody wants) or delays in time (which will be at the expense of the troops in missions). To find the right approach here must continue to be the goal and this will require a close and continuous co-acting in the ongoing process. It might perhaps be possible to improve the cooperation even more. However, the example of the PCMV, here especially the PCMV 1, shows that those involved do not only gain information in the course of the tests, but are also jointly looking for new ways to adapt the requirements to the realities and to find respective approaches and solutions. It was also made clear that with an improved protection of the operating forces the threat in turn will grow again, too, as the adversary keeps adapting himself. This means that the topic of protection must be continuously and closely watched and adapted to new risks. It constitutes so to speak a “never ending story” and is thus cost-intensive. Latest developments and technical solu-

tions for vehicle families and total systems as well as protection technologies were presented by the sectors of arms industry and research. All in all, it was again an inspiring symposium, mainly because involved parties from all areas are brought together to discuss current subjects with each other.

Combat Vehicles

Finally, the attention should be drawn to combat vehicles. Officially, they are not regarded as protected vehicles; however, as tanks or armored vehicles they naturally offer very high protection in all types of missions up to highly mobile combat aside from their capabilities as effectors of the Army. New combat vehicles are about to be introduced. Above all they include the PUMA armored infantry fighting vehicle (AIFV), the BOXER armored

transport vehicle (ATV), and the WIESEL 2 light armored mortar in different variants, e.g. with the TOW antitank missile or as 120mm mortar system. However, the upgrading of already well-proven vehicles is also of significance. These improvements include projects with the LEOPARD 2 battle tank, the Tank Howitzer 2000 or the Multiple Launch Rocket System (MLRS) in combination with the novel Guided Multiple Launch Rocket System. The using of the FENNEK armored scout and observation vehicle as a first base vehicle for the new joint fire support teams within the scope of joint tactical fire support should be mentioned here as well.

As a modern, modular weapon system of the mechanized infantry the PUMA AIFV is considered to be the most important procurement project of the Army. General contractor is the “Projekt System & Management” company, a joint venture of the KMW and RLS companies. The AIFV has the capabilities which current mission experiences demand of modern and future-oriented combat vehicles. These include, for example, the quick, worldwide deployability in the new A400M transport aircraft, high tactical mobility, superior effectiveness, robustness, threat-related protection, enough space for the mechanized infantry squad consisting of nine soldiers, and last but not least the capability for network-based conduct of operations. The PUMA AIFV has advanced technology all around, such as the worldwide best combined protection of its class with modular armor using novel protection technology. The PUMA has the first unmanned cupola of an AIFV with a stabilized 30mm MG 30-2/ABM with 200 rounds per minute. The ammunition consists of shots and sub caliber ammunition (APFSDS-T) against lightly armored vehicles at distances of 2,000 and 3,000 m, respectively. With the air

Armoured Vehicles



PUMA AIFV



BOXER ATV with IoF



LEOPARD Battle Tank 2 A6

Armored Vehicles.

Grafic: ES-Archiv

burst ammunition (ABM) with time fuse technology it is possible to engage hard, soft and also airborne targets up to 3,000 m directly as well as variably in larger areas and also behind defilade positions. A 76 mm six-round HE shell launcher system at the rear can effectively support in close combat and combat in urban areas. Active self-defence systems are planned to be integrated. The EUROSPIKE LR system will be integrated as a "multirole-capable light guided missile system" for the mechanized infantrymen mounted on the PUMA AIFV. Manufacturer is the EuroSpike consortium, a merger of Rheinmetall (RM), Diehl and the Israeli Rafael companies. This modern system is to serve the engagement of tanks, helicopters and infrastructure, fortifications and strong points in all visual conditions up to distances of 4,000 m. For the eight mechanized infantry battalions and other units of the Army a total of 405 AIFVs will be procured in the period from 2010 to 2019. The demonstration including a field trial is to be conducted by the end of March 2009. Subject to the approval by the parliament, the option of series production is to be triggered off by the end of June 2009.

With the BOXER ATV the infantry will receive the first genuinely protected vehicle and a true "mother ship" for its forces. Transacted in German-Dutch partnership the 8x8 version will be developed by the KMW and RLS companies. A group transport vehicle and a command and control vehicle as well as a medical vehicle will be procured for the German Army. As for wheeled vehicles the BOXER ATV is worldwide a unique model of this protection class which is characterized by a successful combination of modularity, multirole capability, mobility, protection and growth potential. Its most prominent features are:

- Modular design with a multiskin hull structure
- Protection against all known mines, effectors from above and direct fire from all sides up to 25mm x 137 MG
- Space for up to 11 soldiers
- Air transportable with the A400M transport aircraft, and armed with 12.7 MG or a 40 mm grenade machine gun in protected armament stations.

With respective command control and communication equipment the BOXER command and control vehicles will be enabled to be integrated into the Army command control and information system (CCIS). The group transport vehicles of the infantry will be the interface for integrating the "Infantryman of the Future" (IoF) system into this command and control system. IoF is a closed, innovative equipment system of the infantry and mechanized infantry group and their soldiers. All, the BOXER ATV and the PUMA AIFV and the IoF system together, provide the infantry and mechanized infantry forces with an enormous technological edge and with a substantial increase in their operational and protection value. At present, studies and tests are conducted with five BOXER prototypes. The delivery of the first ones of a total of about 400 BOXER ATV could start in 2009. Planned for the German Army is a 1st batch of 190 BOXER ATVs of which 125 will be transport and 65 command and control vehicles.

The LEOPARD 2 A5/6 battle tank is one of the most effective and powerful battle tanks in the world. The tank of the KMW general contractor, equipped with the 120mm L44 smooth bore gun of the RM Company, is characterized by an optimal combination of firepower, protection, mobility, and controllability. The remaining 350 battle tanks of the armored corps

of the New Army were improved by upgrading in their effectiveness, inter alia by additional armor and an extended tube with new more effective, upgraded ammunition. 70 battle tanks were furnished with an additional antimine shielding against antitank mines. Further retrofitting measures have been taken into consideration for all LEOPARD 2 battle tanks as of 2010 as an "adaptation to the extended task spectrum". These measures are to enable the armored corps to act in the entire range of options and to be employed in asymmetric conditions. They include, for instance, the improvement of all-round vision and protection against effects from above and behind, integration into the integrated command control and information system of the combat troops, and 120 mm programmable HE shells with a range of 5,000 m. In addition, the operability in built-up areas is also to be improved with 50 UrbOps battle tanks and scheduled to start in 2012. The KMW company has already developed a LEOPARD 2 PSO (Peace Support Operation) battle tank. The Army is considering a limited retrofitting with, inter alia, dozer blade, exterior intercom, and white light headlights and search lights. A shielded armament station is to make the use of a machine gun and nonlethal effectors possible here, too.

The Bundeswehr has orientated itself to the threats in the new type of missions and makes numerous efforts to increase the protection of the own forces as far as possible here, too. Not all necessary actions of the soldiers are possible to be comprehensively protected. This cannot even be fully achieved by the directive of the Federal Minister of Defence according to which the soldiers should move in and operate from protected vehicles only. But all protective measures like tactical procedures, training, reconnaissance, counter-IED means and much more have increased and will enhance the protection of our soldiers in operations. The improvements in the field of "protected vehicles" are considerably contributing to that. Here, the state of the protection has already substantially improved in the past years. However, it must and it will have to be increased even more in order to minimize losses as far as possible and guarantee the operability and sustainability of the Bundeswehr in missions and operations. Here it will be essential even much more than with other armament projects that the intentions in the Bundeswehr Plan and the appeals and promises of the politically responsible figures will at least be adhered to. If one wants to be honest one must admit, however, that the planned procurement of protected vehicles in the "corridor" with 5,500 PCMV/PTVs and thus approximately 28 percent of the requirement is too little until 2015 and too late to ensure the protection of all necessary movements of our service personnel in the missions and operations of the Bundeswehr. ■

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