

PUMA Under Contract – An Interim Report on the State of Realization

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Following the preceding approval of the realization permission by State Secretary Wolf at the Federal Ministry of Defence, the contract for the procurement of 405 production-type vehicles of the PUMA armored infantry fighting vehicle (AIFV) was concluded on 03 July 2009. Subsequently, the Kassel/Germany-based contractor, the “Projekt System & Management GmbH” (PSM) – a joint venture between “Rheinmetall Landsysteme” and “Krauss-Maffei Wegmann (KMW)” – began with the production of the first series vehicles. After their completion they will be subjected to a performance check within the scope of the compliance demonstration. From the viewpoint of the mechanized infantry as the future user the most important stages will be the tactical and logistic operational tests scheduled for 2012. Here, the suitability of the vehicles for their employment in operations will be demonstrated and verified. After the end of the total demonstration program the first vehicles will be available to the troops in late 2013. The response forces and training facilities will be prioritized and they will thus be the first ones to be equipped with the new vehicles. By a steady increase of the production the delivery planning provides for the comprehensive equipping of all users to be finished by 2020.

System Challenges

The PUMA AIFV will completely replace the MARDER AIFV as the primary weapon system of the mechanized infantry. For current and future missions in the entire task and intensity spectrum of the Bundeswehr the PUMA AIFV will provide a weapon system that combines the following factors:

- Mobility
- Multirole capability
- Robustness
- Sustainability, and
- Protection.

The air transportability and thus the quick, worldwide availability are ensured by a modular design of the overall system.

State of the Realization

The master demonstrator (total system demonstrator) for demonstrating and proving the producibility was presented to the public purchaser/acquiring activity on 20 December 2005. The manufacture of five preproduction

preproduction vehicles, the system was considered here under the aspects of tactical usability. The PUMA AIFV was capable of proving its extraordinary capacities during these trials already. The experiences gained in this process are being capitalized on for a further optimization of the overall concept. In total, the implementation of these optimization procedures will make the PUMA AIFV even better and still more efficient and underline its exceptional position vis-à-vis comparable systems.



PUMA Armored Infantry Fighting Vehicle (AIFV) in a Near-Serial Production Configuration State.

Photo: KMW

vehicles was possible to be started right after that. They served for compliance demonstrations of sub-functionalities and component systems with part of them having been conducted with both the industry and the Federal Office of Defence Technology and Procurement, Bundeswehr technical centers and Bundeswehr training areas. In order to be able to give the mechanized infantry as the customer an impression of the efficiency even prior to the realization permission, tests were conducted and evaluations made in the first quarter of 2009 with particular involvement of the user, represented by the Armored Corps Training Center in Munster.

Aside from the technical potential for performance improvement identified by the industry in the development and manufacture of the

Worldwide Unique Protection

The protection of the crew becomes more and more important in the development of militarily used vehicles. With its protection level the PUMA AIFV sets new standards in this field. This high level is achieved in the Configuration Stage C (combat) when the protection modules are adapted to the basic vehicle, which is being realized in a Configuration Stage A (air transportable). This allows the air transport of the PUMA AIFV by the future A400M. Thanks to its ballistic protection and mine protection the PUMA AIFV will be superior to all comparable armored infantry vehicles, which are currently available or under development. Also, with the adaptation of the MUSS multifunctional self-protection system of the EADS

Company a standoff-capable protection system has been realized for the first time which is capable of detecting and identifying approaching missiles and hindering them by several independently conducted threat-related countermeasures in their becoming effective.

Undercarriage Allows High Tactical Mobility

The PUMA AIFV will act conjointly with the LEOPARD 2 main battle tank in future missions, too. This requires high mobility, which is ensured by 800 kW from a High Power Density (HPD) ten-cylinder engine of the MTU Company. A particular engine-adapted gear assembly of the “Renk” Company is used to transform this power. A completely new technique has been applied with the disconnecting of the track and suspension system from the hull. The vibrations are significantly reduced by that which produces less vibratory strain on the crew and a decline in the noise emission inside the vehicle, thus increasing the sustainability of the crew in toto.

A completely new and challenging approach was made by the use of hydropneumatic spring and attenuating elements, which resulted in an improved suspension and attenuation behavior. By the integration of the fuel tanks into the ex-

terior track supports another source of hazard has been moved from inside the vehicle to the outside, which increases the usable interior volume and improves protection of the crew at the same time. Deeply pulled-down protective modules ensure the protection of these tanks.

Effective Weapons Mix with Crew-less Turret

The target categories derivable from the most likely threats of current and future mission scenarios necessitate the availability of different effectors. This is ensured by the configuration of the PUMA AIFV. The 30mm machine gun MK 30-2/ABM realized as primary armament of the PUMA has already produced a large number of the necessary demonstrations. With this weapon it is now possible to also fire programmable air burst ammunition (ABM) of 30mm x 173 caliber in addition to sub-caliber high-penetration arrow ammunition. This ABM can be employed against both soft targets and against the sensors of hard targets, thus forcing them to abort the mission. When leaving the tube all information on distance and ignition time is transmitted to this ammunition via a programming device so that an optimum effect is achieved in the target by a precise dispensing of sub-projectiles. In this process it is possible

to engage both broadly and deeply echeloned targets in partly automated ways. The sub-caliber ammunition is available for engaging semi-hard targets and of infantry fighting vehicles. And the cross-sectionally introduced 5.56mm caliber MG 4 is available as a coaxial weapon for combating soft targets. The PUMA AIFV possesses now also the hunter-killer capability, which has so far been realized with the battle tanks only. This permits the quick handover of a target detected by the commander by means of the periscope to the weapon system team leader (gunner) for engagement. While the gunner engages the target, the commander can continue to concurrently observe the battlefield with the turret-independent periscope.

The MELLIS (multirole-capable light guided missile system) will be adapted to the turret to allow to effectively counter the threats posed by a heavily armored enemy (battle tanks). With these systems it is possible to launch guided missiles, which can be directed to the target in both fire-and-forget and guided modes. The missile transmits in flight via optical fiber link the picture of its integrated camera to the weapon system and onto the displays of the operator (commander or weapon system team leader) so that it is possible at any time to make a target change in the fire-and-observe modus, a target change to higher prioritized tar-



PUMA AIFV in Terrain Tests at Armored Corps Training Center in Munster/Germany.

Photo: PSM



PUMA AIFV in Night Firing Tests at Bergen Training Area.

Photo: PSM

gets or, if necessary, an abort of the mission to avoid collateral damages.

An explosives launcher for firing 76mm ammunition has been chosen as a turret-independent secondary armament. This weapon allows fighting at 180 degrees across the vehicle's rear end in the near zone. Both explosive and fragmentation ammunitions and non-lethal effectors can be fired with this system. The ammunition loaded in six launcher containers is automatically identified. The explosives launcher is operated under armored protection. For dismounted missions the mechanized infantry has at its disposal the already introduced small arms and small antitank arms as well as diverse effectors.

Networked Command Capability

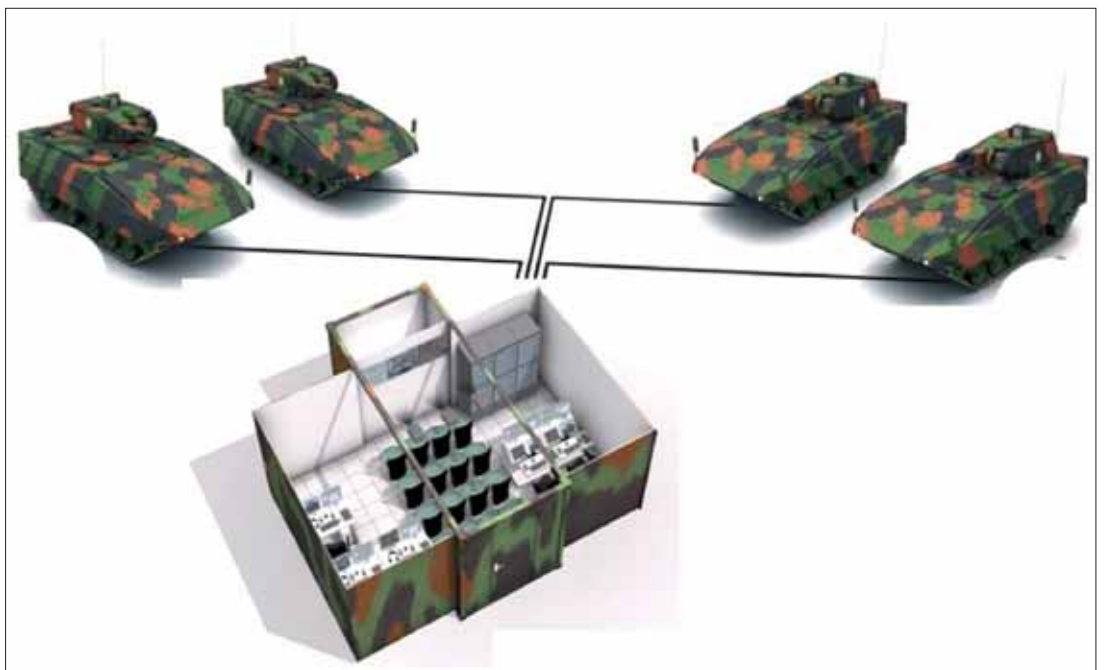
The capability for network enabled operations is attached a key role in current and future mission scenarios. This requires the availability of respective efficient command, control and communication means. With the realization of IFIS integrated command and weapon control system of the combat troops there is a highly sophisticated command and control system available in the PUMA AIFV and thus the linkage to the Command, Control and Information System of the Army.

The already fielded radio communication sets of the SEM family will be made use of up until the delivery of the joint radio equipment that will be qualified for use in inter-service combine. The technical preconditions for a quick integration of this combine-capable radio equipment are presently being created. For that purpose an intercom system will be installed in the system by, among other things, the procurement of the SOTAS IP, which will allow both the digital communication and the linkage to the individual equipment of the In-

fantryman of the Future – Extended System (IoF-ES) of the dismounted squad. The extended-range communication is ensured by the equipping of command vehicles up from company level with a satellite-based system.

Training on Highest Level

The provision of modern training means in the "PUMA AIFV System" was given particular attention. For the first time an operational-



PUMA AIFV Battle Simulator (AGSP).

Graphic: RDE



PUMA AIFV in Terrain Tests at Armored Corps Training Center in Munster/Germany.

Photo: PSM

ly used system has been included in simulation and synthetic exercises. This training is also made possible by the concept of a system-integrated training aid. The training equipment “PUMA AIFV Battle Simulator” (AGSP) was developed for that purpose. Most of the hardware and software-technical prerequisites and functionalities for the simulation are integrated in every PUMA AIFV. For conducting simulation training the vehicles are connected with the Directing, Evaluation, and Control Station (DECS). Moreover, additional control elements and displays are going to be adapted; a head-mounted display (HMD) will be employed for presenting external visions (across-hatch-view, angular mirror, PERI).

The AGSP allows training in all scenarios and in different areas of operation from the level of the individual vehicle up to the platoon level. In that process, the operator personnel will always be in the position to advance a prepared situation online. Preparation and post-analysis can be made directly on site. For that purpose, the DECS, which is comparable to an IT-assisted lecture hall, is equipped with a video projector.

By the networking with additional DECS – if possible via data links to other locations – it is possible to conduct training and exercises up to the company level. The provision of a defined interface ensures the possibility of a connection to future simulation systems. Respective climate-technical equipment (air conditioning)

makes it possible for the DECS to follow the troops to all areas of operation. A first performance check of this training means is scheduled for mid 2010.

In addition, the user is provided digital training means to allow him to use a large number of tutorial programs for theoretical training purposes. The Computer Assisted Teaching and Training Tool (CAT3) provides the instructors with a basis of teaching aids in presentation form with which the training can be shaped according to the group to be trained.

For the training of maintenance personnel there will be training systems delivered to the Army Maintenance School for Land Systems and Army School of Engineering for the segments of the undercarriage, turret, hydropneumatic attenuating elements, and ammunition.

The gunnery training with live ammunition will also be added by two training means. In addition to a new light-intensive firing simulator, which shows the control personnel the load state of the weapon, it is possible to monitor the firing by means of the Tank Gunnery Television Transmission System. This allows the controller to take a monitoring view at the display and indicators of the control panel of the PUMA AIFV at any time and thus to watch the handling by the crew.

In training operations a training muzzle brake replaces the measuring and programming basis for the ABM. The realization of an Electronic Weapon and Effect Simulation (EWES)

makes it possible to dispense with the procurement and use of maneuver ammunition. Intensive lights and loudspeakers ensure the simulation of muzzle flash and firing noise. The procurement of a “Tactical Engagement Simulator (AGDUS)” for the PUMA AIFV is provided for in the realization permission; the conclusion of the contract is still pending.

Basic driver’s training is centrally conducted at the Hammelburg garrison. To that end, a classroom-driving console for a step-by-step schooling of the learner drivers in the use of their respective control panel will be procured (as from 2013) aside from the provision of eight vehicles for practical training. Furthermore, the procurement of two driving simulators (as from 2012) will allow an effective, weather and time-independent training concurrently with economies in environmental and financial resources.

The information and knowledge gained so far from the preproduction manufacturing and the compliance demonstration has resulted in an optimization of the concept. This know-how is being taken account of in the now beginning batch production and will contribute to an increase in the performance of the PUMA AIFV weapon system. Checks of the overall system will be made within the scope of the continuation of the compliance demonstration including the operational testing by the user. When all qualification records are available and the delivery of the PUMA to the troops is going to be made as of the end of 2013, the mechanized infantry will then have the worldwide most sophisticated armored infantry fighting vehicle at its disposal. In connection with the training means to be subsequently provided, the preconditions will be created for the comprehensive training and preparation of the crews for the respective operational tasks.

With the PUMA AIFV which combines mobility, command capability, and fire power simultaneously with a protection for the crew which is unequalled in the world, the Army and thus the armed forces will be enabled to introduce an extremely effective and robust weapon system into missions in the entire task and intensity spectrum of the Bundeswehr. ■

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