

10 September 2013

Effectors, a prime focal point of Rheinmetall R&D: from machineguns to high-energy laser weapons

Firepower trumps cover – in current areas of operations, this old adage is truer than ever. To protect themselves effectively, our soldiers need to be able not only to detect, recognize and identify potential threats earlier, but also to neutralize them with high precision and scalable intensity. Effectors therefore figure prominently in Rheinmetall's overall research and development effort. Today the spectrum ranges from machineguns to high-energy laser weapons.

Machineguns

MG3KWS: Rheinmetall has developed a combat performance upgrade kit for its tried-and-tested MG3 machinegun. MIL-STD-1913 rails mounted on top of and alongside the receiver as well as on top of the feed cover allow all standard optics and optronics to be used with the weapon. A length- and height-adjustable shoulder stock with integrated buffer and adjustable ground spade, a combined carrying and assault grip, a height-adjustable bipod and a new carrying sling significantly enhance its ergonomics in dismounted operations. Moreover, the receiver can be fitted with a camouflage-coloured coating. Still in development is an interchangeable pistol grip with selective trigger (single-shot and sustained fire); a new internal safety mechanism that can be put on safe while the gun is uncocked (not only while the bolt is cocked as before); a device for reducing the rate of fire from 1,200 to 800 rounds per minute and a built-in round counter to be integrated into the pistol grip, which will record mechanical stress. The upgrade kit can be retrofitted during the course of routine maintenance.

RMG7.62: Currently under development, the RMG 7.62 is an externally powered 7.62 x 51mm weapon, sealed to make it largely impervious to environmental influences. All of the components necessary for remote control operation are designed as integral parts and are located in or on the weapon. Its key design features include high reliability, outstanding system safety and easy handling thanks to the integration of all remote control functions; the design enables integration of the RMG7.62 into a wide variety of platforms. The RMG7.62 can fire standard NATO

ammunition with DM60/M13 standard links. A new feature: remote control barrel changing with a bundle of three barrels. If a barrel gets too hot to fire, the barrel bundle is electrically rotated, eliminating the need for manual barrel exchange. There is no need for the operator to leave the safety of the armoured fighting compartment and the gun is ready to get into action again within only 4 seconds. Nanocoatings and high-performance materials assure a long service life and drastically reduced wear of critical components and surfaces. The weapon is not subject to US International Traffic in Arms Regulations (ITAR). It can be set to fire up to 800 rounds per minute. Owing to the weapon's capability to pull high-capacity ammunition belts, its (selectable) high rate of fire and automatic barrel changing feature, the RMG7.62 is basically designed to serve as an effector for remote controlled weapon stations and as a coaxial machinegun for main battle tanks and infantry fighting vehicles. The weapon is being developed in close cooperation with the German Bundeswehr. It is expected to be available starting in 2016, including for export.

RMG50: When a heavy machinegun is required for a weapon station, Rheinmetall's answer is the RMG50, an externally powered 12.7 x 99mm weapon. Advanced materials, nano coatings, a sealed design, and a heavy, chrome-plated barrel assure high functional reliability and a long service life. With enhanced performance ammunition also made by Rheinmetall, the RMG50 has a maximum effective range of 1,800 metres and significantly higher penetrating power. Burst duration and rate of fire (up to 600 rounds per minute) can be adjusted to meet customer requirements. An optional "sniper mode" is available for precision, single-shot engagement of targets. The weapon can also be used in dismounted operations. Compared with other heavy machineguns such as the M2, the RMG50's system weight (remote control) is significantly lower. RMG50 prototypes are currently undergoing intensive technical trials, including pre-series testing and qualification with the Bundeswehr. This weapon, too, will be free from ITAR controls. Series production is slated to begin in 2015.

Medium-calibre automatic cannons

BK27: Made in the former Mauser plant at Oberndorf in southwest Germany, this 27mm aircraft cannon is one of Rheinmetall's best-known products, carrying on the proud tradition of a cradle of the German arms industry. For some thirty years, this gas-operated revolver cannon has been the "drum weapon from Germany" par excellence. It has given the company new access to the world of aviation systems. The BK27 can now be found in the air forces of twelve nations, serving among other things as standard armament in the Tornado, Gripen and Eurofighter – with both belted and non-belted ammunition feeding. With a rate of fire approaching 1,700 rounds per minute, the BK27 has a maximum effective range of up to 4,000 metres. Recently Rheinmetall has introduced an adapter kit for the NG Gripen ("Next Generation"). The BK27 also serves as the effector for the MLG27 light naval gun.

MK30-2 and MK30-2/ABM: The 30 x 173 mm MK30-2 is a gas-operated weapon capable of firing 600 rounds per minute and hitting targets 3,000 metres away. It is designed to withstand the mechanical stress of prolonged firing as well as for a long service life. The ABM variant of the MK30-2 is able to fire airburst ammunition with a

programmable detonation point. Every ABM projectile is programmed in the muzzle brake. The MK30-2 is especially suitable for arming infantry fighting vehicles. For example, it serves as the main armament of the Spanish ASCOD and Austria's Ulan. One of the most thoroughly tested medium-calibre automatic cannons, the MK30-2 ABM is qualified for the Bundeswehr's Puma infantry fighting vehicle. The MK30-2 ABM features in Rheinmetall's state-of-the-art modular medium-calibre Lance turret built into the Piranha III wheeled armoured infantry fighting vehicle used by the Spanish Marines. Currently, this weapon is being integrated into a UT30BR turret for the Brazilian armed forces; intended for an air defence role, it has a non-specific rate of fire. Finally, Rheinmetall has successfully integrated a Lance turret armed with a MK30-2/ABM into the Boxer wheeled infantry fighting vehicle.

Wotan 30 ABM: Rheinmetall is now developing a new 30mm automatic cannon, the Wotan. Externally powered, it enables complete control of the firing and loading cycle. Its rate of fire is in the region of 200 per minute. Like the MK30-2/ABM, it can fire programmable airburst ammunition. The Wotan 30 ABM is especially easy to maintain, requiring no special tools. Moreover, its special nano coating and other design features will result in significantly lower lifecycle costs. The weapon itself is characterized by high accuracy and low susceptibility to failure. Owing to its compact dimensions and integrated gun cradle the Wotan 30 can be easily integrated into a turret or weapon station. Not subject to ITAR rules, the weapon also lends itself to naval applications. Prototype versions of the weapon already exist and were presented in a live fire demonstration at Rheinmetall Medium Calibre Day 2012.

Oerlikon Revolver Gun MK2: At Rheinmetall Medium Calibre Day 2013, the Oerlikon Revolver Gun Mk2 made its debut, one of Rheinmetall's most recent development projects. This remotely controlled, networkable, 35 x 228mm air defence gun features beltless ammunition feeding. Using clips, two men can replenish the 252-round magazine in about eight minutes. This enables 18 bursts of 14 rounds each. Its rate of fire is roughly 200 per minute. The Mk2 is designed to fire Rheinmetall's programmable AHEAD airburst ammunition. This technology also figures in the Bundeswehr's gun-based MANTIS air defence system.

Cerberus and Hydra 40mm grenade launchers

Rheinmetall's extensive array of 40mm ammunition, including 40 x 46mm (low velocity/LV, medium velocity/MV, long range/LR), 40 x 51mm MV and 40 x 53mm high Velocity (HV), covers all operational scenarios. Moreover, Rheinmetall is currently perfecting the Cerberus grenade launcher and Hydra automatic grenade launcher. Both are equipped with hydraulic shock absorbers that reduce the recoil to the level of LV ammunition. They are thus able to fire LV, LR and MV grenades. The single-shot Cerberus can be used either as a build-on or standalone launcher. The magazine-fed Hydra can fire single rounds or three-shot bursts.

Large-calibre smoothbore guns

L47 LLR: Seeking to develop heavy, effective main armament for lighter-weight fighting vehicles such as wheeled APCs, Rheinmetall is currently working on a new cannon, the 120mm Light Low Recoil (LLR) L47. The optimized barrel, use of advanced materials, the recoil buffer system and integrated gun cradle result in

reduced weight and lower recoil, coupled with the high accuracy and effectiveness of 120mm tank ammunition. Flowing into development of the LL47 LLR is Rheinmetall's in-depth experience with its globally acclaimed, battle-proven 120mm smoothbore tank gun. The L44 has proven highly effective around the world, even in the most extreme climate zones. It serves as the main armament for the Leopard 2 and M1 Abrams as well as the Japanese Pz90 and Italy's Ariete. It can also be integrated into other tanks. Long range, accuracy, a high first-shot hit probability and a long service life are all typical characteristics of the L44. The same is true of its successor, the longer L55, which delivers significantly improved battlefield performance. It serves as the main armament for Leopard 2 MBTs in the arsenals of Germany, Spain, Greece and Qatar. The L55 is also qualified for the Abrams M1A1.

All 120mm Rheinmetall tank guns can be modified to fire programmable ammunition with the help of an easy-to-integrate upgrade kit.

Lasers

Rheinmetall has long been on the cutting edge of laser development. High-energy laser (HEL) weapons are extremely accurate, silent, have a tremendous maximum effective range, are very powerful, produce no recoil, have an inexhaustible supply of ammunition and offer scalable intensity. They are thus capable of neutralizing a wide variety of modern threats in conventional and asymmetric conflicts.

In late 2012, Rheinmetall successfully tested its 50kW HEL weapon technology demonstrator, encompassing the full kill chain of target detection, tracking and engagement. Among other things, a small projectile measuring 82 millimetres in diameter was successfully detected, tracked and neutralized.

Equally feasible are weapon platforms with integrated automatic cannon and laser weapons. For example, Rheinmetall has combined an MLG27 light naval gun with an HEL weapon technology demonstrator, producing the first dual gun-and-laser weapon system. In numerous tests, it has demonstrated its effectiveness in tracking and engagement.

Furthermore, Rheinmetall is developing concepts for shipboard deployment of HEL weapons. Effectors of this type can be connected to the ship's C4I and weapon engagement systems, enabling them to correspond with the sensors, the target evaluation hardware and software, and the rough tracking of other weapon systems. Given the abundant power on board ship, a 100kW laser system seems realistic. With a total weight of less than three tons and a space requirement of approximately 12.5 cubic metres, a high-energy laser weapon of this type would have a maximum effective range of up to ten kilometres.

In 2013 Rheinmetall plans to build at its own expense a 60kW technology demonstrator with greater beam power. Besides laser weapon stations, the system will include 35mm AHEAD revolver guns. This will enable investigation and study of possible synergies between laser weapons and automatic cannon.

Finally, the company will continue to pursue the concept of a platform-mounted mobile HEL weapon – successfully implemented in 2011 with a 1kW evaluation

model mounted on a TM170 special vehicle. Rheinmetall is eager to study the parameters for integrating an HEL weapon on a vehicle operating in field conditions.

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