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HEL on wheels – Rheinmetall’s high-energy laser effectors get moving

Building on a 125-year heritage, Rheinmetall has once again made good its claim to be the global leader in high-energy laser (HEL) technology. Just a few months ago the Rheinmetall Live Laser Demonstration 2013 set a new standard for operational deployment of the Group’s mobile and stationary high-energy laser effectors. At CANSEC 2014 visitors can learn more about Rheinmetall’s HEL-activities at the Rheinmetall stand.

In a European first, three different vehicle platforms were equipped with HEL effectors. The versatile tactical potential of this forward-looking technology was amply demonstrated in a wide variety of operational scenarios at the Rheinmetall Live Laser Demonstration 2013.

A high point of the demonstration came with the successful engagement of a swarm of jet-powered drones by a stationary Skyshield air defence system, whose effectiveness likewise relies on a HEL effector. The Skyshield HEL effector enabled successful engagement of a series of incoming generic mortar rounds. The maximum effective range of this technology demonstrator is 3,000 metres, an increase of 1,000 metres compared to the previous year’s performance.

Rheinmetall’s innovative laser weapon technology draws equally on the company’s longstanding expertise in conventional weapon design and its globally leading air defence capabilities, a combination that makes it especially effective in combating small, highly manoeuvrable targets.

In mid October 2013, in the fourth of a series of HEL live fire demonstrations at its proving ground in Ochsenboden, Switzerland, Rheinmetall once again dramatically demonstrated its leading position in the world of laser weapon technology. The event not only highlighted the company’s tremendous progress, but also offered an opportunity to provide concrete examples of the new technology’s functional applications

Selected to serve as mobile HEL effector platforms were the GTK Boxer wheeled armoured vehicle, a modified M113 armoured personnel carrier, and an 8x8 Tatra truck.

In terms of installation space, cooling and energy supply, the GTK Boxer armoured transport vehicle is currently configured for a 5 to 10 kW laser. As a 5 kW laser and a 10 kW laser are identical with regard to mass and volume, a 5 kW HEL effector ("Mobile HEL Effector Wheel XX") was installed completely autonomously in the GTK. An M113 tracked APC from the RUAG company was equipped with a 1 kW HEL effector ("Mobile HEL Effector Track V"), while a protected Tatra truck made by the Drehtainer company carried a containerized 20 kW HEL effector ("Mobile HEL Effector Container L"). The Roman numerals V, XX and L correspond to the laser categories 5 kW, 20 kW and 50 kW.

An air defence HEL effector with an output of 30 kW was integrated into a Skyshield gun turret.

In the 5 kW laser category, the M113 Mobile HEL Effector Track V demonstrated its operational potential for disposing of unexploded ordnance and clearing battlefield obstacles. Without having to exit the vehicle's protected fighting compartment, the crew detected mines and improvised explosive devices, irradiating them with the laser from a safe distance, which caused them to deflagrate in a matter of seconds. Afterwards the laser weapon successfully cleared a barbed wire obstacle at a distance of approximately 70 metres.

A major advantage of HEL effectors is their outstanding flexibility with regard to escalation and de-escalation. Laser beams are eminently scaleable. When fired at optics, radio antennas, radars, ammunition or energy sources, for example, HEL effectors are able to neutralize entire weapons systems without destroying them. The Mobile HEL Effector Container L in the 50 kW laser class clearly demonstrated this. At ranges of up to 2,000 metres, optics such as riflescopes and remotely operated cameras were detected, tracked and subsequently neutralized or destroyed. The crew was also able to use its HEL effector to quickly cut the power supply cable of a radar mast and then the mast itself. Laser engagement of an ammo box followed by swift deflagration of its explosive content formed the finale of this phase of the demonstration.

The 20 kW-class Mobile HEL Effector Wheel XX mounted on the GTK Boxer features a special HEL effector module that takes full advantage of the vehicle's unique modularity and Rheinmetall's proprietary HEL effector know-how, which is based on beam superimposing technology. First, the crew of the high-mobility vehicle fired the laser at a petrol canister, which immediately burst into flame.

The crew also demonstrated that their HEL effector could neutralize an oversized heavy machine gun mounted on a pickup truck by causing a round in the ammunition belt to deflagrate, while posing no risk to the gunner. Furthermore, operating in tandem with the air defence HEL effector's Skyguard radar, the Mobile HEL Effector

Wheel XX demonstrated a complete kill-chain capability against vertical take-off unmanned aerial vehicles (VTUAV). In the domain of ground-based air defence, these VTUAVs form part of the new “low, slow, small” threat spectrum. The Skyguard radar detects and identifies the hovering octocopter. Then the HEL Boxer takes over, conducting the rough and fine tracking. This example demonstrated a future application of combined arms air defence capable of coping with the “low, slow, small” threat.

The effectiveness of Rheinmetall HEL effectors in air defence applications was plain to see. In roughly four seconds, the 30 kW laser weapon technology demonstrator deflagrated an 82mm mortar shell at a range of 1,000 metres. Then, in a counter rocket, artillery, mortar and missile (C-RAMM) scenario, the effector demonstrated its ability to neutralize very small ballistic threats in mid flight. Twice the demonstrator detected, identified, tracked and engaged 82mm-diameter steel spheres fired by compressed air in rapid succession, scoring five out of five the first time, and four out five the next. In the “low, slow, small” scenario, the HEL effector neutralized a VTUAV reconnaissance drone by destroying its optronics. But the crescendo came with the successful downing of three jet-powered UAVs that flew into the target zone one right after the other, replicating a saturation attack.

This event, conducted in front of an audience of international experts, underscores once again Rheinmetall’s technological lead in the forward-looking field of high-energy laser effectors.

For more information, please contact:

Oliver Hoffmann
Head of Public Relations
Rheinmetall AG
Tel.: +49-(0)211-473 4748
oliver.hoffmann@rheinmetall.com