



SMART**MISSIONS**

RHEINMETALL PATH

A PROVEN AUTONOMOUS KIT TRANSFORMING CREWED
VEHICLES INTO UNCREWED FORCE MULTIPLIERS

TAKING RESPONSIBILITY IN A CHANGING WORLD



PROVEN. AGNOSTIC. TRUSTED. HIGHLY AUTONOMOUS. THAT'S WHAT PATH STANDS FOR.

Rheinmetall PATH is a proven autonomous kit (A-kit) designed to provide military vehicles with the capability to operate uncrewed across complex terrain in all kinds of hostile weather conditions.

PATH-equipped vehicles make a significant difference in keeping soldiers safe on the frontline. They improve the mass and lethality of armies, they reduce the number of soldiers put forward, and limit exposure time to a potential attack. They are also highly effective at drawing out the enemy's fire and thus exposing its positions. The various capabilities of Rheinmetall PATH enables armies to achieve high operational tempo and contribute to mission success.

PATH raises the bar and takes military operations forward.



Proven

Offers a wide range of control modes already fielded to execute all types of mission.



Agnostic

Works on any drive-by-wire platform and is adaptable to any payload or equipment.



Trusted

Performs all tasks safely and reliably, regardless of the weather or the environment.



Highly autonomous

Accomplishes autonomous driving and navigation with artificial intelligence technologies.

ARTIFICIAL INTELLIGENCE CAPABILITIES

- **Image recognition/classification**
Object detection and classification through the onboard camera systems allow for improved target and obstacle tracking through highly cluttered and obscured environments.
- **Sensor fusion and data association**
Data from perception sensors onboard vehicles is fused to come up with a probabilistically accurate map of the area delivering a clear perception of the surroundings.
- **Simultaneous localization and mapping (SLAM)**
Algorithms fuse data from all sensors to simultaneously create a map and localize the vehicle so it can still operate if the GPS signal is lost.
- **Obstacle detection and avoidance**
To ensure safe operations, advanced perception algorithms provide rich situational awareness in order to plan safe paths/trajectories around obstacles.
- **Target classification and tracking**
Onboard sensor data is fused to allow the vehicle to detect, classify, and track all of the objects in its vicinity.
- **Environment mapping and terrain analysis**
Using the onboard sensor data, a 3D topological model of the ground plane is generated to distinguish between ground and obstacles. This ensures that the vehicle navigates challenging terrain safely.
- **Trajectory generation and route execution**
When in motion, the vehicle jointly uses multiple onboard path planning algorithms to generate the safest path throughout the environment. This ensures successful mission completion without any collisions.
- **Mission planning and task assignment**
Task assignment strategies enable a single operator to control multiple vehicles at the same time, significantly reducing cognitive burden and allowing to focus on the mission success.
- **Hierarchical multi-operator control**
The system control hierarchy is designed to allow multiple operators to interact and to control each vehicle, while maintaining a safe handoff between operators in each control mode.



Driven by PATH A-kit, Rheinmetall Mission Master performs multiple mission profiles on its own

PROVEN TECHNOLOGY

Rheinmetall PATH A-kit was put through its paces in the 2018 European Land Robot (ELROB) trial held in Belgium. PATH allowed Rheinmetall's Mission Master Autonomous Uncrewed Ground Vehicle (A-UGS) to excel in the 'Mule' scenario and win the competition by a considerable margin against eight other platforms.

PATH has also successfully provided the capability to operate uncrewed on other military vehicles including the Wiesel 2 Digital, the new Boxer 8x8 infantry fighting vehicle, and the HX family of high-mobility logistic vehicles.



Digital Wiesel vehicle

MASTERING THE ART OF SYSTEMS INTEGRATION

With its longstanding experience supporting forces around the world, Rheinmetall has acquired an incomparable skill set in network-enabled operations and system integration.

This depth of technical knowledge ensures a smooth integration of Rheinmetall PATH with many types of applications, such as soldier systems and C2 applications. The A-kit is currently networked to both the Rheinmetall Argus soldier system and Rheinmetall Command and Control Software, which can be installed in any user's battle management system.

STANDARDIZED OPEN ARCHITECTURE

The architecture of Rheinmetall PATH is open and flexible in order to be continually upgraded and improved. This way, it rapidly integrates new innovations and sustains future growth as customer's requirements evolve.



Boxer infantry fighting vehicle



HX military trucks

VAST RANGE OF TELEOPERATION OPTIONS FOR MULTI-LEVEL CONTROL

PATH provides a variety of control modes to meet the operational objectives of multiple scenarios.



SAFE OPERATION

Rheinmetall PATH is engineered to deliver safe operation of the uncrewed vehicles at all times, in compliance with MIL-STD-882 and DEF-STAN 00-56 standards. Each control mode incorporates multiple layers of protection to ensure an always-safe vehicle operation. On top of this, Rheinmetall is committed to keeping a man in the loop for all weaponized operations and any critical, life-affecting decision, enabling only human decision-makers to act in these situations.



Rheinmetall Mission Master UGSs forming a convoy

COLLABORATIVE WORK

Collaborative behaviours allow autonomous vehicles to work together in teams: they communicate with each other and collaborate in a distributed manner. Multiple types of operational missions such as zone surveillance, target position transfer, and slew-to-cue can hence be accomplished.

Wolf Pack

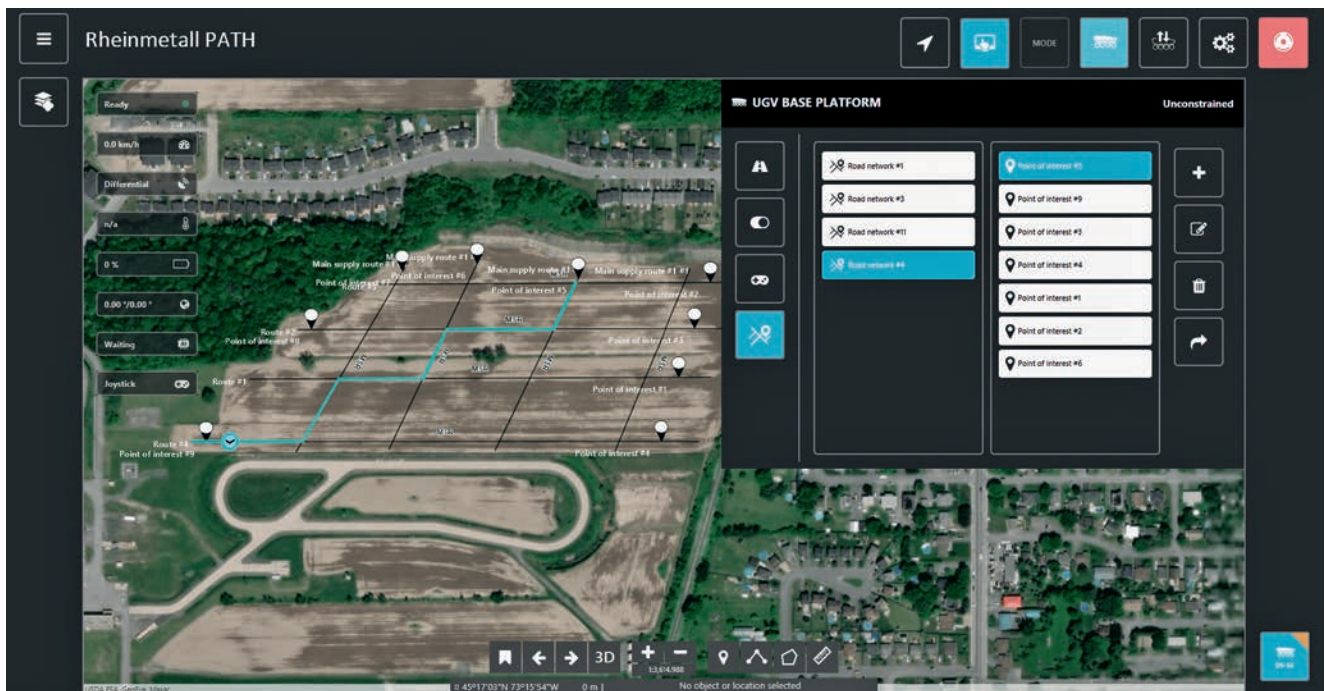
Instead of handling the low-level tasks of each vehicle, the “wolf pack” concept enables operators to better focus on the global mission. This Rheinmetall PATH capability allows a single operator to manage multiple vehicles working as a wolf pack, controlling them from anywhere using LTE networks, SATCOM, or military cloud.

Crewed-Uncrewed Teaming

By adding the eyes and ears of uncrewed vehicles to their battlefield picture, operators of crewed platforms can grow the reach of their situational awareness and significantly improve soldiers’ safety. This ability to control these “wingmen” from crewed vehicles is quite a force multiplier.

SIMPLE AND INTUITIVE DEVICE MENU

Rheinmetall PATH offers a very easy-to-use control interface, where all the critical data is available at a glance. The centralized menu not only provides information on several statuses of the autonomous vehicle, but also allows to exploit the equipment of each different payload in real-time.



Rheinmetall PATH control interface displaying the “Road network” mode

NO ORDINARY NAVIGATION MODES

Dynamic route

By selecting a tactical entity on the map, the operator points out the element that the vehicle needs to follow (another A-UGS, a vehicle, a soldier) at a customized distance.

Go-to

The operator can select any position on the map and the autonomous vehicle will reach this exact location using the standard mode of navigation.

Send route

Precise mission routes can be drawn, saved, and selected on the user interface, and then sent to the uncrewed vehicle to be executed on command.

Road network

In this mode, the vehicle is commanded to reach a specific position by taking the shortest route within the road network previously mapped out by the operator.

Record/playback

The operator can activate recording while the uncrewed vehicle is traveling any route so that it can then be commanded to follow the recorded route again.

Mission mode: the navigation enhancer

This mode allows the automation of repetitive tasks: the operator can pre-program various sequences of navigation modes in a defined order. Such a special mode frees up the operators and lets them focus on more vital assignments.

To learn more about the Rheinmetall PATH A-kit capabilities,
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