Expand your mission capabilities for your military vehicle. With our retrofittable robotics functions.

GENERAL DYNAMICS
European Land Systems–Mowag

Together ahead. RUAG

RUAG Robotics
Vehicle Robotics Kit – Project Description

RUAG and GDELS-Mowag (General Dynamics Land Systems-Mowag) have teamed on a project to expand the mission capabilities of the EAGLE IV vehicle by intro-ducing the retrofittable vehicle robotics kit called VERO. VERO enables vehicle teleoperation and provides operators with the capability to conduct either manned or unmanned operations, depending on the situation and threat. The system includes a Multi Purpose Sensor (MPS) head from SAGEM which provide day and night reconnaissance and surveillance capabilities while manned or unmanned.

For ELROB, the Remote Control Centre (RCC) will be installed in a RUAG container.

The planned stages of the project are:

Stage 1, Retrofit of an existing vehicle into a tele-operated vehicle. The design goal is to allow both unmanned and manned operation, using a retrofittable kit with minimal intrusion into the manned vehicle space.

Stage 2, take the tele-operated vehicle and expand the capabilities to allow semi-autonomous operation. This means that the vehicle drives autonomously, following both specific coordinates and taught paths, recognizes obstacles and stops before them waiting for further instructions.

Stage 3, the autonomous capabilities of the vehicle are expanded to detect obstacles and avoid them. This stage will include the creation of a mission planning system.

Stage 4, the vehicle is equipped with a system for automatic vehicle following.

Operational Advantages

Teleoperated and Robotic operations using Unmanned Vehicles reduce or remove operator risks and human resources needs in highly stressful and dangerous environments, such as minefields, areas of potential explosive hazards and enemy controlled zones. These are lifesaving advantages in the full mission spectrum of Major Combat, Stabilization and Normalization.

Technical description

System design in the vehicle

The VERO Rack houses all components necessary to enable teleoperation of the vehicle. The on-board vehicle computer is the central administration/processing and control unit of the system. Communication with the Remote Control Centre (RCC) is established via the broadband RB radio system (VisCom).

The video system, which also processes the analogue video streams (PAL) of the roof mounted MPS reconnaissance sensor, compresses the video streams of the drive cameras (MPEG 4) and transfers them via the Ethernet Switch, responsible for central data distribution in the system, to the ComCom and subsequently to the VisCom. All commands that control vehicle functions, such as steering, braking acceleration and gear changes are transferred to the drive by wire system via CAN bus communication.

VERO Rack

Vehicle Computer
The vehicle computer (German: Fahrzeugrechner) is the central administration/processing unit of the system. It allows complete operation of the baseline vehicle including payload, and activates and monitors the autonomous functions.

Driving
Dynamics Controller

Driving dynamics controller
The driving dynamics controller (German: Fahrdynamikrechner) is process oriented and serves to avoid critical driving situations under normal operating and road/surface conditions. Normally, the Anti-lock Brake System (ABS) and Electronic Stability Program (ESP) are part of the FDR.

Basic functions of the FDR are:
Using vehicle condition data, driver inputs and boundary conditions defined in the vehicle model, the FDR calculates the maximum possible speed through curves and the vehicle inclination and corrects the input data, if necessary.

Communication
Communication between vehicle and RCC is provided by the RB10 VisCom System and includes diversity, however without booster/amplifier. The Communication Computer (ComCom) combines and prepares the data in a data stream that is compatible with the radio system.

Eagle Eye (to be mounted on the vehicle)

Eagle Eye – Drive camera system
Drive camera, GPS receiver and other sensors are located in a modular sensor bridge called Eagle Eye.

Drive cam and side cams use similar housings with integrated wipe and wash function.

The analogue (PAL) video streams of the four cameras are digitalised, compressed (MPEG4) and converted into an IP data stream by one encoder, each. Resolution, frame rates, etc. can be individually adjusted by the encoder. This allows transmission of camera data in varying qualities and thus at different bit rates.

Eagle Eye (to be mounted on the vehicle)

EAGLE IV with installed VERO Kit

In observation position, the drive cams are deactivated, and depending on the camera selection of the MPS reconnaissance system, the PAL signal is transmitted at the maximum possible bit rate, i.e. at the highest possible quality.

The reversing camera already installed in the Eagle IV serves as the rear video camera.

EAGLE IV installed rear video camera

Reconnaissance platform SAGEM MPS (example only)
In reconnaissance mode, camera type (infrared or video) as well as pan, tilt and zoom will be selected/operated at the control head. The video stream created by the reconnaissance platform is displayed at the MPS control unit located in the RCC.

The Sagem MPS is a full panoramic day/night stabilized observation sight that provides the manned or remote operator with surveillance and target designation capabilities. The MPS sensors include day camera, thermal imager, laser range finder and laser pointer. The day/night images are fused further increase detection, recognition and identification probabilities. This platform is shown here as a sample only and is not part of the VERO Kit.

Sagem MPS observation sight

Drive by Wire System (DBW)
The DBW system used off the shelf product and incorporates two separate circuits:
– Accelerator / brake and steering system (analogue steering) and
– START / STOP, Gear Control and CAN Relay Box (CAN control)

The DBW system includes redundant design in the acceleration/brake and steering circuit.

Power supply
The required power for the overall system is provided by the Eagle IV generator, which supplies a maximum of 300A at 24V and also feeds an additional 100 Ah payload battery.

System design RCC

An RB10 Remote Control Centre (RCC) is used for the remote control of the Eagle IV and for operation of the reconnaissance system.

The overall RCC system comprises the following components:
1. Computer for control/operation and display
2. Display units
3. Ethernet Switch
4. ComCom
5. Steering wheel with pedal assembly
6. Function Key Block
7. VisCom (without booster/amplifier, but with redundancy)
8. SAFRAN MPS control unit (optionally)

RCC display units and RCC Rack

Vehicle operation

For vehicle operation, display of the maximum number of four parallel incoming camera video streams is required. The maximum possible overall bandwidth is limited by the radio system. In addition, the major operating parameters required for vehicle operation (km/h, rpm, etc.) are displayed.

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