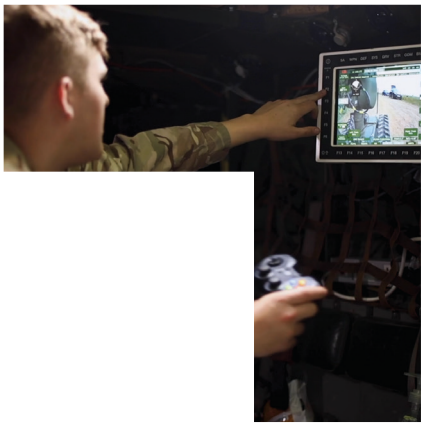
Using robots to support troop operations

CGI Openland360 enables the UK Ministry of Defence to demonstrate and evaluate the use of Unmanned Ground Vehicles



The UK Ministry of Defence (MOD) needed to assess how unmanned ground vehicles (UGVs) could be used from within armoured fighting vehicles by serving soldiers:

- The CGI Openland360 vehicle platform integration and mission system allows crew members to monitor and control all aspects of the platform from a single screen. It integrates data from sensors and systems to provide mission information and intelligence:
- The demonstration added UGV control and monitoring to the CGI OpenLand360 interface, integrating it with the rest of the platform using the Generic Vehicle Architecture (GVA) standard:
- The demonstration used serving soldiers in real world scenarios to determine usability and value of UGVs in an Intelligence, Surveillance and Reconnaissance (ISR) role:
- This project proves that the integrated system is suitable for use by serving soldiers, with high usability scores, and provoked many suggestions as to how such systems can bring operational benefit.

Aim: Demonstrate effective operation of unmanned ground vehicles within defence vehicles

UGVs or robots have the potential to contribute to and enhance military operations, ranging from carrying supplies and equipment to weapons platforms. The challenge is to make technically complex UGVs usable in real defence situations so that the technology enhances force effectiveness without overburdening the soldiers with complexity.

The UK Ministry of Defence (MOD) and Defence Science and Technology Laboratory (Dstl) commissioned CGI to demonstrate a system that could address this challenge, to be evaluated experimentally using the UK Army training ground, with serving troops and currently fielded vehicles.

CGI **OpenLand360**

The need to integrate with existing ways of working

Modern armoured fighting vehicles are complex. A wide array of external and internal sensors, cameras, communications equipment and systems provide the crew with the tools to operate as an effective team. Shared Situational Awareness (SSA), a common understanding of what is going on around the platform and in the mission, is key to mission success. SSA is the result of the merging of data from all platform elements. The aim of the experiment was to;

- Add the control and monitoring of a UGV to existing standards based vehicle systems so that it extended the horizon of the SSA without putting crew or dismounts at risk without using a bespoke UGV specific, and control station.
- Assess the usability of the system and how the crew chose to use the system.
- Assess the utility of the resulting human-machine team in close support of an armoured fighting vehicle.

The solution

Using the CGI OpenLand360 platform and mission system to demonstrate UGV usage

As the leader in the development of vehicle platform and mission systems, CGI assembled a team that included Digital Concepts Engineering (DCE), a robotics SME and Human Factors Engineering Solutions (HFES), a specialist human factors consultancy. Working with Dstl, we added the capability to monitor and control UGVs to the CGI OpenLand360 platform management system.

CGI OpenLand360 is a complete platform management and mission system that conforms to the MOD Generic Vehicle Architecture (GVA) standard. This is the future command system for all UK vehicles, so it is deigned to have a suitable user interface and to seamlessly integrate all the elements of the platform. CGI extended GVA to include unmanned platforms and developed a communication protocol to connect to the DCE robotic control system.

DCE provided two tactical tracked robots that were fitted with steerable daylight cameras capable of 100 times zoom and laser rangefinders, and could follow a route sent from the host vehicle.

Sensor to shooter capability

CGI, in collaboration with HFES, we designed the screens to allow the sharing of UGV monitoring, driving, commanding and mapping to between the vehicle crewmembers. Deep integration into the GVA system used the targeting, system alarms and mapping systems already in CGI OpenLand360, so that targets identified via the UGV could be immediately addressed by the platform or passed off platform for other equipment and officers to address. Example screens are shown overleaf.

Real platforms in real situations with serving soldiers

The system was tested as part of the 2019 Army Warfighting Experiment (AWE), arranged by Dstl, on the Army Salisbury Plain training area. The system was added to a standard Warrior infantry fighting vehicle with two crew stations and hand controllers, one in the turret and one in the dismounted soldier transport section. The Warrior was fitted with its own cameras, a GPS and tactical radio to communicate with the two UGVs.

A serving Warrior crew trained on the system for 15 minutes before being tasked with searching for vehicles and dismounted troops in a range of environments. Unguided, the crew adapted their standard reconnaissance and surveillance procedures for a remote platform. The warrior crew used uploaded routes and manual control to move the UGVs up to a kilometer from the host warrior and found all the vehicles and infantry “targets”. Situational awareness was effectively and safely extended and shared around the platform using the system.

Using recognised human factors methods to assess the system

A key element of the experiment was to assess the usability of the system. At the end of each mission, the crews were interviewed and a questionnaire-based assessment was used to derive the following conclusions:

Usability: all participants rated the system as at least as good as the “industry average” and, in some cases, significantly better.

Workload: the UGV would reduce workload in comparison to the existing operational capability. This is a good result taking into account that the user is not familiar with the system.

Situational Awareness: Despite using a relatively inexpensive camera system, the crews gave ratings of slightly better than the existing operational capability, with a high score for information presentation and clarity.

Outcomes

The experiment proved that UGVs can be used by existing crews to increase the horizon of situational awareness using standard control systems.

The system assembled by the CGI led team was seamlessly integrated and worked flawlessly during the experiment which had the following main conclusions:

The standard is fit for purpose and ready to be exploited

The GVA standard was designed to be open and easily extended to integrate the monitoring and control of new equipment without the need for new screens. This experiment proved, using CGI OpenLand360, that GVA systems can be used to exploit unmanned platforms without the need for complex bespoke control systems unique to each unmanned system.

Inexpensive UGVs can have a high tactical value.

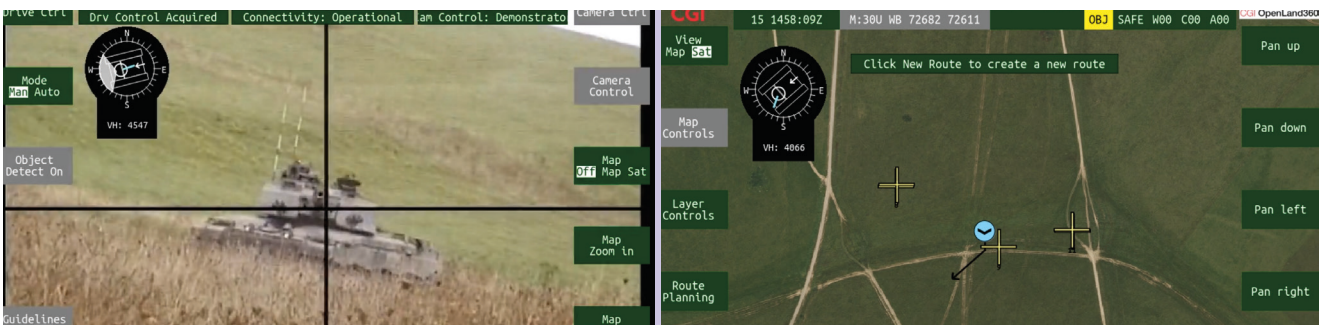
The experiment proved the utility of smaller, inexpensive, conceivably expendable UGVs in close tactical situations. Having got “hands on” the system, serving soldiers quickly saw many ways they could improve the tempo and safety of current practices.

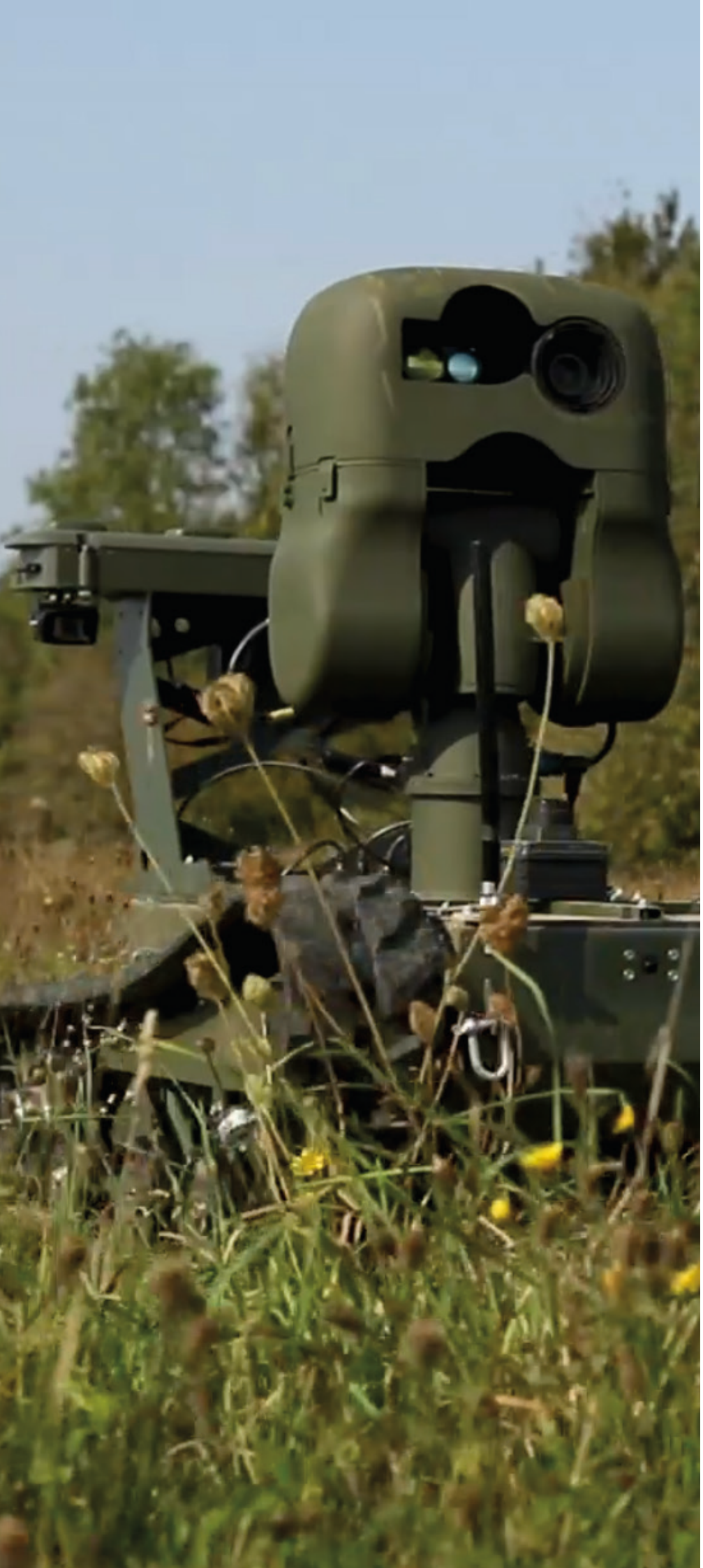
CGI OpenLand360 is an ideal platform for future rapid learning experiments.

The “open” nature of GVA allows re-use of information and software elements such as mapping, roles, video, targets and alarms. A complete GVA system such as CGI OpenLand360 can be rapidly expanded to accommodate new equipment and data into battlefield tactics and processes.

Identifying the next steps

The experiment posed many follow on questions in the areas of usability, flexibility and tactical testing which are under consideration for future studies by Dstl to further inform the UK Army as it begins to implement unmanned systems. Future planned work will demonstrate the integration of a range of UGVs with different roles that can easily be accommodated into the single GVA interface with minimal change to the system.





Centre Stage and in the news

The experiment was showcased in a demonstration of connected battlespace to Ministers and other distinguished persons as part of the Army Warfighting Experiment 2020. The DCE X3 robot (left) and CGI OpenLand360 were exemplars of future force development.

Acknowledgements:

Thanks to DCE, HFES and Dstl. Imagery credit @Dstl.

About CGI

Insights you can act on.

Founded in 1976, CGI is among the largest IT and business consulting services firms in the world. We are insights-driven and outcomes-based to help accelerate returns on your investments. Across hundreds of locations worldwide, we provide comprehensive, scalable and sustainable IT and business consulting services that are informed globally and delivered locally.

cgi.com

For more information
Visit CGI OpenLand360 | CGI UK
Email us at enquiry.uk@cgi.com