

case study



Heavy-Duty Unmanned Ground Vehicle

**Safety-Critical Robotics Delivered
Through On-Demand Engineering**

OVERVIEW

A leading robotics manufacturer developed a heavy-duty unmanned ground vehicle (UGV) designed for hazardous operations where human presence is unsafe. The platform supports tasks such as explosive ordnance handling, hazardous material inspection, and remote operations in austere environments.

To bring this system to operational readiness, the client needed to rapidly deliver a reliable, safety-critical robotic platform while navigating strict regulatory requirements, limited prototype hardware, and a highly compressed development schedule. MedAcuity was engaged as an embedded engineering partner to augment internal teams and accelerate delivery.

CHALLENGES

The project faced a unique combination of technical and organizational constraints:

- **Complex, safety-critical robotics software**

The UGV required precise coordination of high-torque actuators, mobility systems, sensors, and a multi-jointed manipulator arm. Software behavior needed to be deterministic, reliable, and tightly coupled to evolving hardware designs.

- **Limited access to physical hardware**

Only a small number of prototype vehicles were available during development, shared across multiple engineering disciplines. Software development had to occur directly on hardware, making off-site development impractical.

The client needed a partner capable of rapidly integrating into an existing team, working directly with hardware, and executing complex robotics development without delay.

CHALLENGES CONT.

- **Military standards and security constraints**

The program operated under strict compliance requirements, significantly limiting staffing options and necessitating vetted, on-site engineering personnel.

- **Aggressive delivery timelines**

Staffing could not scale until program initiation, but delivery expectations began immediately, leaving little margin for onboarding or experimentation.

The client needed a partner capable of rapidly integrating into an existing team, working directly with hardware, and executing complex robotics development without delay.

THE MEDACUITY SOLUTION

MedAcuity engaged as a fully integrated co-development partner, extending the client's engineering organization through strategically scaled resources and targeted technical expertise.

- Provided a dedicated, on-site engineering team that operated as an extension of the client's staff.
- Integrated seamlessly with mechanical, electrical, systems, and quality teams to maximize efficiency around limited prototype hardware.
- Contributed across the entire development lifecycle, from embedded software and system integration to testing, security hardening, and production readiness.
- Applied safety-critical software development practices drawn from regulated industries, strengthening development rigor early in the program.

TECHNICAL CONTRIBUTIONS

MedAcuity's team supported the maturation of the UGV platform through:

- Migration to a modern embedded computing platform enabling advanced autonomy and video processing.
- Development and integration of low-level device drivers for sensors, motor controllers, and manipulator feedback systems.
- Integration of robotics middleware and communication interfaces.
- System optimization to meet real-time performance and reliability requirements.
- Support for operating system updates, cybersecurity hardening, and compliance verification.
- Establishment of continuous integration and regression testing across mobility, manipulation, vision, and communications subsystems.

CONCLUSION

This project demonstrates how on-demand, safety-critical engineering expertise can accelerate complex robotics programs under tight constraints. By embedding deeply, working hands-on with hardware, and elevating development discipline, MedAcuity helped deliver a mission-ready unmanned ground vehicle while leaving the client organization stronger and better prepared for future innovation.

ENGINEERING IMPACT

MedAcuity's engineers worked as a unified team with the client's staff, enabling faster iteration and higher system quality.

- Improved development discipline through enhanced requirements management, traceability, and failure-mode analysis.
- Early risk reduction by identifying architectural and integration issues before they surfaced in system testing.
- Higher reliability through continuous testing under realistic operating conditions.
- Knowledge transfer and workforce development, as client engineers gained hands-on experience with safety-critical development practices.

The result was a development effort that advanced rapidly while maintaining the reliability required for field deployment.

BUSINESS RESULTS

The engagement delivered meaningful, lasting outcomes:

- Successful delivery of a production-ready heavy-duty UGV.
- Improved schedule predictability through just-in-time access to specialized engineering expertise.
- More efficient use of engineering budget by scaling resources only when needed.
- Strengthened internal engineering practices retained beyond the engagement.
- Establishment of an ongoing partnership supporting future robotic platforms and enhancements.

