Defence services

- Thought leadership
- Technical consulting
- Performance engineering
▪ Thought leadership
▪ Technical consulting
▪ Performance engineering
Mission-ready engineering solutions

Ricardo delivers wide-ranging engineering programmes across light and heavy land and sea operating spaces and is the partner of choice for many original equipment manufacturers.

The quality of our solutions results from a unique combination of operational, technical and strategic expertise, coupled with access to world-leading engineering facilities.

We work with special forces units internationally to deliver performance reliability and technology integration that make a real difference in extreme and demanding operating conditions.

Ricardo has long been engaged in the marine sector and fully understands the challenges of increasingly strict emissions legislation, the imperative of improving ship energy efficiency and reducing fuel consumption, while also minimising total design, construction and operating costs.

We are leading independent developers of marine driveline prime movers, diesel engines, electric drives and auxiliary ship systems.
Who we are

The cornerstone of our business is the quality of our people and the experience, professional diversity and outlooks that they offer.

Alongside them are those we have attracted to the sector from other walks of life – government, academia and science – as well as colleagues who offer insight from Ricardo’s work in areas such as motorsport, environmental regulation and clean energy generation.

Our teams include experts regarded as among the best in the world in their fields. They are specialists who understand their industry’s structure and idiosyncrasies every bit as much as the standards and practices that underpin it.

Binding us together is a shared value of being free to offer trusted expertise. We’re a natural home for professionals who want to see things done properly – who believe it is their responsibility to anticipate problems and deliver tangible results.
How we help

We offer a unique mix of operational, technical and strategic expertise, coupled with access to world-leading engineering facilities.

<table>
<thead>
<tr>
<th>Thought leadership</th>
<th>Technical consulting</th>
<th>Performance engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td>• New system acquisition critique</td>
<td>• Technology migration</td>
<td>• Complete system optimisation</td>
</tr>
<tr>
<td>• System verification engineering</td>
<td>• Technical investigation</td>
<td>• Niche manufacture and assembly</td>
</tr>
<tr>
<td>• Auditing</td>
<td>• Project management</td>
<td>• Engines</td>
</tr>
<tr>
<td>• New technology insight and studies</td>
<td>• Energy efficiency</td>
<td>• Driveline and transmission systems</td>
</tr>
<tr>
<td></td>
<td>• Incident investigation</td>
<td>• Hybrid and electric systems</td>
</tr>
<tr>
<td></td>
<td>• Fleet performance</td>
<td>• Vehicle engineering</td>
</tr>
<tr>
<td></td>
<td>• Condition monitoring</td>
<td>• Noise, vibration and harshness (NVH)</td>
</tr>
<tr>
<td></td>
<td>• Corporate strategy</td>
<td>• Electromagnetic compatibility</td>
</tr>
<tr>
<td></td>
<td>• Environmental impact assessment</td>
<td>• Vehicle and infrastructure testing</td>
</tr>
<tr>
<td></td>
<td>• Future-trend modelling</td>
<td>• Power management</td>
</tr>
<tr>
<td></td>
<td>• Health and usage monitoring</td>
<td>• Electrical system design and battery management</td>
</tr>
</tbody>
</table>
### Ricardo expertise in defence systems

<table>
<thead>
<tr>
<th>Systems engineering</th>
<th>Modelling and simulation</th>
<th>System test solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Systems definition</td>
<td>• Requirements analysis</td>
<td>• Engine dynamometer testing</td>
</tr>
<tr>
<td>• Standards definition</td>
<td>• Operational analysis</td>
<td>• Anechoic powertrain testing</td>
</tr>
<tr>
<td>• Whole vehicle integration</td>
<td>• Trade off studies</td>
<td>• Transmission spin testing</td>
</tr>
<tr>
<td>• Interface design</td>
<td>• Complex systems modelling</td>
<td>• NVH assessment</td>
</tr>
<tr>
<td>• Configuration management</td>
<td>• Visualisation</td>
<td>• Performance and emissions testing</td>
</tr>
<tr>
<td>• Electronic architectures</td>
<td>• NATO Reference Mobility Model</td>
<td>• Vehicle dynamics</td>
</tr>
<tr>
<td>• Hybrid technologies</td>
<td>• Vehicle system modelling</td>
<td>• Airflow testing</td>
</tr>
<tr>
<td></td>
<td>• Blast modelling</td>
<td>• Benchmarking</td>
</tr>
<tr>
<td></td>
<td>• Rollover analysis</td>
<td>• Environmental testing</td>
</tr>
<tr>
<td></td>
<td>• Fuel economy decision support</td>
<td>• Battery testing</td>
</tr>
<tr>
<td></td>
<td>• NVH</td>
<td>• Multi-fuel assessment</td>
</tr>
<tr>
<td></td>
<td>• Modelling</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• CAE</td>
<td></td>
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</tbody>
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### Driveline and transmission systems
- Systems definition
- Standards definition
- Whole vehicle integration
- Interface design
- Configuration management
- Electronic architectures
- Hybrid technologies

### Intelligent transportation systems
- COTS/MOTS integration
- Automotive technology transfer
- Advanced thermal management
- Control algorithm integration
- New concept assessment

### Engines
- NVH
- Modelling
- CAE

### Vehicle systems
- HMMWV, p8
- FED, p20
- Propulsion, p14

### Hybrid and electric vehicles
- HMMWV, p8
- FED, p20
- Propulsion, p14
An independent, impartial full-systems view of defence projects. Ricardo is backed by a global world-class engineering team used to delivering projects in compressed timescales.

**Complex programme management**
- Multiple stakeholder management
- Management of international teams
- Requirements management
- Flexible programme resourcing
- Integrated cost reduction
- High-value-problem resolution
- Product and technology strategies
- Due diligence
- Process efficiency
- Legislative requirements
- Financial planning and management
- Supply chain appraisal

**Through-life support**
- Failure analysis
- Training
- Maintenance scheduling
- Spares and provisioning
- Through-life planning
- Capability planning
- Technology roadmapping
- Technology insertion
- Obsolescence management

**Logistics support**
- On-site support
- Logistics planning
- Intelligent transportation
- Vehicle-to-vehicle communications
- Power systems optimisation
- Active safety and autonomous drive
- Safety critical software
- HUMS

**Niche manufacture**
- Engine manufacture
- Transmission manufacture
- Whole-vehicle manufacture
- Rapid prototyping
- Systems and subsystems
- Specialist vehicle conversions
- Control and electronics
- Waterproofing of vehicles
- Manufacturing design
- Bespoke assembly
- Configuration control
- Technology upgrades

FTTS, p11  Mastiff, p18  SARTRE, p11  Foxhound, p10
Who we help

Our clients include:

- UK MOD
- BAE Systems
- Babcock International
- OSHKOSH
- NIMR
- Bombardier
- PATRIA
- KMW
- Rheinmetall
- Texelis
- NEXTER
- Renault Truck Defense
- BMT
- Morgan
- SC Group
- STX
- Hyundai Rotem
- Samsung
- KIA
- TATA
- Mahindra & Mahindra
- GDLS
- Lockheed Martin
- Leidos
- Thales
- Qinetiq

Improving the safety of the US Army’s iconic HMMWV

The High Mobility Multipurpose Wheeled Vehicle (HMMWV) or ‘Humvee’ is a core element of the US Army’s vehicle fleet. In order to improve its safety, serviceability and agility, Ricardo embarked on a project in 2014 to modify a fleet of ten HMMWs belonging to the Michigan National Guard. Ricardo-engineered ABS and ESC systems were installed to significantly improve occupant safety. Following an NHTSA report in 2014, which highlighted the considerable safety benefits of ABS and ESC systems in passenger cars, Ricardo developed a unique system, and the first of its kind, for the HMMWV, based on the adaptation of commercial automotive ABS and ESC system components.

The complete package developed and tested by Ricardo for the HMMWV included anti-lock braking, electronic stability control, active rollover protection, traction control, and improved brake calipers, pads and rotors. The entire system leverages low-cost, proven components engineered by Ricardo specifically for the arduous requirements of service in a military environment. It was also designed for ease of upgrades to the existing fleet.
Electric power and propulsion upgrade

Our marine defence client needed to address power and propulsion system issues, as well as to implement an operational role change, for one of its vessels. The client was also considering a range of generation plant upgrades, which would need to be considered in implementing alternative electrical power systems for its marine fleet.

With their expert engineering support teams operating at peak capacity, the client sought external support from Ricardo to analyse and propose solutions to meet their requirements.

Our role was to identify and analyse suitable alternative high- and low-voltage electrical power systems, considering ease of system integration, technical risks, electrical system compatibility, operation, improvements to reliability, and cost. Ricardo provided a clear and comprehensive report of the viable alternative systems – giving detailed analysis, summary conclusions and expert recommendations. The report included a weighted, colour-coded matrix describing key aspects of each option, and diagrams to illustrate potential system changes. This was a time-critical project successfully delivered against demanding deadlines.

The UK ‘Challenger 2 Life Extension Project’

In June 2016, Ricardo signed a memorandum of understanding with Belgian weapons systems designer, manufacturer and integrator, CMI Defence, to collaborate on a response to the invitation from the British Ministry of Defence to tender for its ‘Challenger 2 Life Extension Project’ (LEP). The project will see the upgrade of the British Army’s main battle tank fleet.

CMI Defence has extensive history and knowledge in relation to the delivery of heavy firepower gun-turret systems. Known under the brand name Cockerill®, CMI Defence weapons systems are battle proven, reliable and safe, and demonstrate a firepower capability rarely seen on the market. CMI Defence is thus perfectly positioned to apply its systems capabilities in the Challenger 2 project.

Ricardo’s position as a leading authority on automotive platforms in the UK makes it CMI Defence’s ideal partner for this work. Ricardo’s vast knowledge of Challenger 2 stems from its former successful contracts with DSTL and DE&S for powertrain studies, which provided demonstrable options for Platform Obsolescence Management and upgrade opportunities.
The Foxhound was developed by Ricardo and Force Protection Europe and represents a fresh structural approach, maximising occupant protection and vehicle robustness and versatility.

The core concept is based around a V-shaped hull mounted along a central spine, which disperses the force of an explosive blast. The ‘V’ is at a steep angle and integrated with a ‘pod’ (the cabin) and an armoured ‘skateboard’ chassis to retain vehicle dexterity. The pod is hinged to allow easy access to the drivetrain for maintenance and repairs.

The powertrain, axles and most suspension components are housed within the V-spine on the ‘skateboard’, meaning that if a wheel is blown off, for example, the vehicle remains driveable.

The basic skateboard can support a variety of interchangeable pods, including those for flatbed trucks, reconnaissance vehicles and ambulance configurations. In addition, the vehicle is built from a series of interchangeable modules, allowing individual components such as the engine or exhaust to be replaced in less than an hour.

The Foxhound underwent more than 12 months of rigorous blast and mobility testing before release to the MoD. Today, it is the most highly protecting and agile vehicle of its size and weight in operational use.

Quad bike on-board-power-generation module

Ricardo designed a crank-mounted generator to fit on an existing mobile power source, such as quad bike tricycle or motorcycle, for the provision of up to 2kW of low-voltage electrical power

Advantages
• Designed for easy retro installation
• Does not degrade performance of base vehicle
• 6/12/24V permanent magnet generator
• 1.5–2kW output
• Minimal 8kg additional weight to platform
• Always available

Simple lightweight logistic platform to enable:
• Provision of truly mobile power
• Localised power supply for event lighting and general power supply
• Battery charging
• Repair and maintenance – vehicle charging, welding equipment
• Farming/agriculture in-field support for portable machinery, animal husbandry equipment, etc.
Future Tactical Truck System

The US military’s Tank-Automotive Research, Development and Engineering Center (TARDEC) appointed US truck maker Navistar Inc. to design and deliver a next-generation tactical vehicle prototype that leveraged advancing automotive technologies to enhance safety, fuel economy, ride and handling, terrain range and capacity.

Navistar and Ricardo joined forces to bring a broad spectrum of automotive engineering and technology expertise to the project.

With fuel for military use costing up to US$1000 per gallon at the point of front-line use, reducing fuel consumption was paramount. Ricardo’s Total Vehicle Fuel Economy (TVFE) approach and analysis and simulation tools were used to bring electrical components and accessories on board to significantly reduce parasitic fuel losses.

A ‘strong’ hybrid powertrain was used to facilitate stealth operations and ‘silent watch’ mode, where the engine is turned off for long periods but electrical load on the vehicle remains high.

The team developed a totally new chassis platform that exceeded ride and handling performance targets and used cost-effective passive actuation systems. Suspension systems were configured to reduce logistical footprint and manufacturing investment. Common components were used to reduce tooling costs and minimise requirements for on-board spares.

The project was delivered to aggressive timelines, key to which was the co-location of the Navistar and Ricardo teams, at Ricardo, allowing issues to be resolved and decisions to be made quickly.

SARTRE vehicle platooning

Ricardo led the seven-partner SARTRE project to develop strategies and technologies for vehicle platoons, autonomous vehicles operating on public highways and a prototype platooning system.

Based on the premise that vehicles and robotic systems working together provide greater benefits than vehicles operating in isolation, the aim of the project was to develop vehicle and infrastructure technologies that would allow one vehicle, driven by a trained professional, to lead a group of automated tailing vehicles.

As part of the €6.4M EU-co-funded FP7 project, the Ricardo team led the platoon safety analysis and developed the platoon control system and longitudinal and lateral control algorithms.

The systems were developed and analysed under real-world conditions. The control system performance was enhanced using real-time V2V data and was based on existing technologies (ACC, EPAS, sensors) using tailored, upgraded software. This was combined with advanced software for optimal platoon control.

The demonstration platoon system was successfully implemented, with a five-vehicle mixed platoon safely tested on tracks and demonstrated on public Spanish roads. There were fuel economy benefits of 8% for the lead vehicle and 16% for the following vehicles, with a gap size of 5m at 90kph. Benefits of the new technologies will include reduced fuel consumption and greenhouse gas emissions, improved traffic flow and journey times, increased driver and passenger comfort and convenience, and fewer accidents.
Our defence support services focus on client-specific challenges to ensure you benefit from the game-changing technologies that we bring to land, air and sea.

Defence support services

Our portfolio of services targets:
- Reducing cost
- Compressing timescales
- Programme leadership
- Autonomy and critical systems

Vehicle integration
Whole-vehicle and sub-system design and integration from concept to high-quality manufacturing.

Engineering services
Ricardo delivers cost-effective, high-quality defence systems engineering.

Technology services
Ricardo combines advanced technology implementation with a rich heritage of truly exceptional, industry-shaping defence innovations.

Strategic consulting
Strategic solutions to manage the increasing complexity and cost of battlefield technology.

System integration
Ricardo has a long track record of success in the automotive sector and has been the engineering consultancy of choice for many well-known industry names.

We span the breadth of the sector, and from passenger cars to trucks and super bikes to Tuk-Tuks, Ricardo engineering has made a difference.

In the military sector, Ricardo was the designer and integrator of the Land Rover WMIK, a vehicle that has been the backbone of defence integration business activities, which have grown and developed in response to heightened threats in the deployed space.

Our vehicle engineering capability has supported a range of original equipment manufacturers, both in wheels and tracks, in the UK and internationally. Our ability to manufacture short production runs of technically sophisticated components, assemblies and complete vehicles has served the sector well, with a number of bespoke vehicles in service around the world.

Ricardo has delivered vehicle-performance improvements to new and legacy equipment, accepting challenges set by time- and resource-pressured clients and end users alike.

Engineering services
Ricardo has been the engineering partner of choice for many original equipment manufacturers. Our wide engineering capabilities have enabled solutions to be provided in the light to heavy operating space in land and sea and air. Ricardo has re-designed and engineered land-based vehicles to improve performance in fuel efficiency and emissions, reducing weight and increasing ballistic protection in response to increased operational threat levels.
Technical solutions
Ricardo invests in and develops its own technology and innovative solutions for application across a number of market sectors.

In the defence market, we offer:
- Hybrid and electric drives
- Kinetic energy storage solutions
- Battery power and control electronics
- Drive-by-wire systems
- Infra-red sensors
- High-ballistic-absorbing seating
- Composite pods
- Overhead weapon stations
- Autonomous vehicles
- Efficient, small high-performance engines
- Waste-heat recovery systems
- Intelligent driver aids

Ricardo is committed to finding the best solutions, using leading-edge, complex modelling and simulation tools to enable reliable and proven solutions and prototypes to be developed to perform as designed.

Hybridisation
The hybridisation of powertrains for surface and sub-surface vessels is becoming more critical, giving higher efficiency, increased availability and reduced servicing. Extension of mission range through the addition of electrified powertrain components and ancillaries, in addition to low-noise approach modes, provides a compelling argument for hybridisation.
Marine

Ricardo has long been engaged in the marine sector and fully understands the challenges of increasingly strict emissions legislation, the imperative of improving ship energy efficiency and reducing fuel consumption, while also minimising total design, construction and operating costs.

Ricardo is a nominated supplier of marine support to the UK MoD. For over 30 years, Ricardo has been a selected key supplier to the Marine Engine Group of the MoD’s Defence Equipment Support Team, providing independent, wide-ranging specialist technical services in the fields of power plant selection and operation. Ricardo is a member of the Naval Advisers on Fuels and Lubricants Working Groups.

Submarine propulsion systems

The Submarine Propulsion, Energy, Support and Integration facility (SPESIFY) of the Australian Defence Material Organisation (DMO) engaged Babcock and Ricardo as subject matter experts to support a study about all phases of the submarine programme through design, construction and operational life. The study is part of a programme seeking to procure a new class of conventionally powered (non-nuclear) submarine to replace the Collins class.

Ricardo was selected due to its extensive experience of diesel propulsion system R&D testing using land-based facilities, including those for the development of surface warship and submarine propulsion systems. The study helped to identify the best candidate equipment for the diesel power, energy storage and air-independent propulsion systems for the new submarine. The study identified three suitable options for SPESIFY, outlining associated costs, timescales and related technology de-risking potential. The results of the study will enable the Australian Government to make an informed decision regarding the nature and benefits to be realised from land-based testing facilities which, in turn, will enable Australia to significantly enhance its submarine expertise.
**Through-life support services**

*Ricardo offers an extensive portfolio of marine-leading ‘through-life’ support services associated with internal combustion engines, propulsion packages and system optimisation that ensure the technically and financially sensed exploitation of the vessel.*

Ricardo service takes into account the user requirements and, together with the specific challenges they face, delivers life cycle analysis and support. Ricardo expertise can assist in the development and preparation of service and maintenance schedules, remote support, spare parts inventories and optimisation, and engine/system optimisation strategies to cope with increasingly stringent operational requirements.

Engine management system optimisation and control helps our customers to carry out a more efficient and financially appropriate exploitation of the vessel during its life span.

The adoption of techniques and strategies from other industrial sectors, such as automotive or power generation, ensures solutions are delivered at the leading edge of technological advance.

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**Marine diesel engines**

*Ricardo is a preferred supplier for Defence Equipment & Support (DE&S), a bespoke trading entity of the UK MoD. As part of a two-year contract, Ricardo is providing impartial and independent technical advice and support on all aspects of in-service and planned future marine diesel installations.*

Ricardo is providing technical expertise to the MoD for marine diesel engines in the power range 5 kW–5 MW, operating both as main propulsion systems and on-board generators. This work involves deeper investigation of particular aspects relating to operational experience, gaining an understanding of fundamental issues and developing solutions. The independence of Ricardo from commercial engine manufacturers and overhaul facilities provides additional and unique value to the client. In addition, the depth of Ricardo’s technical knowledge in the area of medium-speed marine diesel engines is pivotal to the project. Ricardo will also provide access to engine test beds and in-house capabilities, for example, to conduct emissions testing.
Hybrid technology for military applications

Hybrid technology is poised to offer even greater benefits in the military setting than already seen in the commercial and private vehicle sectors.

With improvements in efficiency and productivity of vehicles and transport infrastructure seen in civilian applications expected to translate to similar military advantages, significant additional performance and sustainability enhancements can be made through the use of hybrid technologies targeted to the specific characteristics of military vehicles and operations.

Given the wide-ranging demands placed on military vehicles – including significant speed changes over varied terrain, the large volume of off-road activity and an average vehicle power requirement approaching 40% – hybrid technologies featuring energy recovery, engine right sizing, stop-start, alternate on-board power supply, combustion efficiency, accessory electrification and the export of power for external use, offer significant potential benefits.

### Anticipated impact of hybrid technology in military applications

**Survivability**
- Additional power source (export or vehicle load)
- Silent running
- Increased torque
- Improved manoeuvrability
- Power source redundancy
- Potential for reduced heat signature

**Sustainability**
- Reduced fuel use/through-life cost
- Reliability of system components (reduced brake pad wear)
- Greater potential for future technology insertion and upgrades

**Maintainability**
- Increased lifecycle of some components reduces maintenance schedule/burden

**Mobility**
- Additional torque
- Additional manoeuvrability (e.g. using hub motors)
- Increased control of torque delivery with electric drive

**Lethality**
- Greater availability of auxiliary power for export

**Interoperability**
- Modularity
- Improved interchangeability of parts (motors more interchangeable than diesel engines)
- Potential for application of common sub-systems between different vehicles

**Fuel efficiency**
- Critical for reduced logistics support. Reduces the number of personnel on convoys, potentially saving lives
The selection of hybridisation systems for military vehicles requires expert knowledge of defence vehicles and operations, military infrastructure and communication systems, applicable legislation and regulations, safety protocols, and environmental and other circumstantial factors.

Ricardo is an experienced, independent expert partner for defence clients looking to exploit the potential of hybrid technology for their vehicle fleets and operational systems. We have developed project and development processes specific to the complex requirements of defence vehicle programmes, and our teams follow a robust supplier audit process, critical in the design stages for defence hybrid vehicles where the use of new, unproven technologies, materials supply strategies and single sourcing can significantly jeopardise programmes.

Ricardo has worked with a number of key suppliers to support a range of defence hybrid projects

L-3 Communications Magnet-Motor GmbH (Germany)
Hub motors, generators, electronics

Jenoptic AG – ESW (Germany)
Generators, electronics, stabilisation systems

Danaher Motion (US)
Hubs and motors

BAE Systems (US)
Series hybrid system

QinetiQ (UK)
Series hybrid system

Rolls-Royce Distributed Generation Systems (inc. MST) (UK)
Hub motors and generators

A123Systems (US), SAFT (France), Altairnano (US) etc.
Li-ion batteries
Every programme has its own unique circumstances in terms of operational deployment, logistics supply, maintenance environment and commercial considerations. Our land and marine engineering teams provide support solutions designed on a case-by-case basis. However, the objective of all solutions we offer is to enable our clients to achieve and sustain maximum capability, system availability and cost effectiveness throughout the life of their equipment.

We offer expert engineering support, comprehensive through-life capability management (TLCM) and agile operational support. This includes a full range of Post-Design Services (PDS), configuration control, safety cases, asset and whole fleet management, spares, obsolescence, repairs and maintenance, training and mid-life upgrades with a suite of contracting options.

As an OEM and design and engineering authority, Ricardo has decades of experience in providing deployable land and marine systems for the vast majority of the MoD’s requirements and for many other defence forces. These systems include special forces vehicles, marine hybrid upgrades, armoured tracked system upgrades and protected mobility fleets.

**Post Design Services**

These services are formally contracted for in-service phases of a piece of equipment’s lifecycle. PDS can comprise a broad range of activities designed to maintain in-service equipment capability.

Examples of PDS activities are:
- Configuration management
- Obsolescence management
- Technical reporting
- Function and design reporting
- Engineering surveys
- Modification implementation
- Design/prototype testing
- New component design and testing
- Technical documentation
- Onsite training

Ricardo deploys teams of specialists to carry out support of all PDS activities. Our teams have worked with various organisations, providing a flexible portfolio of services to ensure equipment fulfills its life expectancy. Our team can also advise on mid-life equipment improvements and replacement purchases.

Our core strength is ensuring that long-term equipment capability is designed from the outset. We utilise a systems engineering approach to produce performance-based support solutions. Our aim is to provide assurance and verification of engineering designs, delivering a tailored, sustainable and cost-effective support solution.

Through-life support

The most advanced equipment and capabilities in the world can become ineffective without appropriate in-service support solutions.
Total systems optimisation

An initiative aimed at improving through-life cost efficiency on both land and marine platforms.

Total systems optimisation (TSO) is an algorithmic approach to the optimisation of systems and sub systems. It was first used in conjunction with the US Army Tank Automotive Research, Development and Engineering Center (TARDEC) for their Fuel Efficient Ground Vehicle Demonstrator (FED). This was an initiative by the Office of the Secretary of Defense (USA) to improve vehicle technology to reduce fuel consumption.

Ricardo was contracted to conceptualise, develop, build and test an all-new vehicle that would demonstrate significantly greater fuel economy than an M1114 HMMWV, while maintaining tactical vehicle capability in order to showcase ‘best-in-class’ and emerging technologies. Ricardo conceived the FED to be a highly mobile, capable and survivable four-passenger tactical vehicle that would maximise fuel efficiency across all vehicle systems.

The vehicle was to meet or exceed all performance attributes of the M1151 HMMWW, whilst also exceeding its fuel efficiency by over 70%.

The vehicle is able to carry four 95th percentile crew members and their combat equipment, including an optional remote weapons station, on a wide variety of missions. Mobility is enabled by a height-adjustable air-spring suspension, locking differentials and CTIS. It offers upgradeable B-kit ballistic protection with additional blast protection provided by the integral V-hull and a 16" ground clearance. 30kW of onboard electrical power is available on the move or at idle to support the base vehicle and mission-critical GFE, now and into the future. A vehicle curb weight of only 4,500kg (A-kit) allows transportability by a variety of assets.

Collaborative effort with supply base

- Data-driven system selection using modelling and simulation
- Cutting-edge systems engineering tools and methods
- Outreach efforts outside of traditional defense supply base

Results

- Over two years of on-ground testing shows >70% fuel efficiency improvement vs M1151 and significantly improved acceleration
- Test results correlated with predictions, validating Ricardo modelling simulations
- Roadmap to 110% improvement identified for upgrades
- Additional improvements outside drive cycle

Since successful completion of FED Alpha, Ricardo has demonstrated the efficacy of its modelling and through-life cost-saving capabilities on the UK MoD Mastiff family of platforms and the Challenger 2 Main Battle Tank. Further work is being undertaken to explore waste-heat reduction opportunities on UK MoD naval platforms.
Credible and relevant tactical wheeled vehicle platform

**Fuel economy**  7.5 mpg composite
- 12.6 mpg convoy escort
- 7.1 mpg urban assault
- 4.8 mpg cross country
- 0.51 gal/hr idle

**Payload**  1734kg payload (w/ B-kit)
- 95th percentile accommodation
- “Golden HMMWV” cargo volume

**Performance**  50 mph speed on 5% grade
- 30kW onboard power

**Weight**  4,500kg VCW (A-kit)
- 5265kg VCW demonstrated (B-kit)
- 7000kg GVW

**Survivability**  Integral V-hull
- Blast-protected seating
- Upgradeable B-kit

**Mobility**  18” step climb
- 60% grade
Ricardo's strategic consultancy practice offers an extensive portfolio of management and environmental consulting to help senior executive teams address high-impact issues and resolve operational problems, at every stage of the value chain.

The majority of our consultants are qualified engineers with executive-level experience within the transport sector. Our environmental and energy advisers are at the forefront of policy creation and programme delivery for a range of governments and multinational organisations.

Unlike 'pure' management consultancies, we offer advice and analysis informed by direct industry and regulatory experience.

Clients include transport operators, manufacturers and financial and government institutions, and our assignments range from acquisitions and post-merger integration support, through to designing business turnaround programmes, modelling of future transport trends and resource scarcity impact assessments.

In the defence sector specifically, we have helped clients undertake local market audits, challenge supplier cost structures, reform procurement programmes and review internal safety processes.

Services include:

- Business strategy
- Market entry
- Corporate sustainability programmes
- Economic impact assessments
- Commercial due diligence
- Regulation and policy
- Quality and High Value Problem Resolution (HVPR)
- Integrated cost reduction and operations improvement
- Mergers and acquisitions
- Low-carbon technology assessments
- Regulatory compliance, planning and risk management
- Sale of non-core business units
- Modelling of future transport trends
- Resource scarcity impact assessments.
The Ricardo group

Maximise efficiency and eliminate waste.

A global engineering and consulting business that specialises in the transportation, energy and scarce resource sectors.

Our work extends across a range of market sectors – including passenger cars, commercial vehicles, rail, defence, motorsport, power generation and government – and we are proud to possess a client list that includes transport operators, manufacturers, energy companies, financial institutions and government agencies.

Through our multi-industry knowledge and deep technical expertise, we are uniquely positioned to handle our clients’ toughest strategic and operational challenges, with previous assignments that have included strategy development, cost reduction, safety management, regulatory compliance and environmental impact assessments.

Meanwhile, our in-house engineering capabilities enable us to provide high-quality prototype and low-volume manufacturing of complex products and assemblies, including engines, transmissions, electric motors and generators, battery packs and fuel cell systems.

Yet, across everything we do, in every assignment we undertake, we remain committed to the ethos of our founder, Sir Harry Ricardo, one of the most innovative mechanical engineers of his time, who, in 1915, set out on a mission to maximise efficiency and eliminate waste.
Shaping environmental strategy
Ricardo’s services help our clients understand current and potential future impacts of operations and how to manage them.

Post Design Services
Ricardo has a wealth of in-service engineering management of in-service assets to sustain life expectancy.

Vehicle design and integration
From concepts to whole vehicle design and development, Ricardo provides a turnkey service.

Armoured vehicle engine and transmission design
Comprehensive engineering capabilities across all defence and special applications from conventional applications to solutions for electric and hybrid vehicles.

Portable power
With the increasing demand in the field for electrical power, Ricardo’s novel solutions and robust engineering yield greater operational flexibility.

Asset health management
Through application of Total Systems Optimisation, we provide the most efficient and secure route to return on asset investment.

Engine lightweighting and fuel optimisation
Lightweighting, engineering and reverse engineering and optimisation for multi-fuel engines.

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Powerpack design and integration
Fundamental combustion system optimisation, friction reduction, thermal management, waste-heat recovery and calibration.

Vehicle design and integration
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Hybridisation
We engineer, develop, and test a variety of hybrid and electric battery configurations.

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