PRESS RELEASE

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Artemis, Bombardier and Ricardo to collaborate on rail brake energy recovery research

• Ground-breaking research project aims to create industry first by providing environmentally-friendly regenerative braking capability – with on-board mechanical energy storage system – for diesel commuter trains
• Based on the Artemis Digital Displacement® hydraulic pump-motor and Ricardo's Kinergy flywheel high energy density storage system
• Bombardier Transportation providing its combination of world-leading rail engineering and system integration expertise
• Combined system expected to offer operating fuel savings of between 10 and 20 percent
• Project co-funded by the Technology Strategy Board through its 'Accelerating Innovation in Rail' programme

A ground-breaking collaborative research and development project on rail brake energy recovery is scheduled to commence in the second half of this year and will see Ricardo join forces with fluid power expert Artemis Intelligent Power and world-leading rail technology expert Bombardier Transportation. The system to be researched is intended for use on diesel powered multiple units. It is conceived as a cost-effective solution that could be retrofitted to existing rolling stock as well as incorporated into new rail vehicles. To demonstrate a complete rail driveline incorporating this energy storage technology, the system will be coupled to a wheel-set supplied by Bombardier and will be tested on a dynamometer rig at Artemis’s facility in Midlothian, Scotland. It is anticipated that a follow-up project will progress to installing and testing the system on an operating train.

The combined Ricardo Kinergy and Artemis Digital Displacement® system, together with Bombardier’s world-leading rail equipment manufacturing and system integration expertise, will enable this ground-breaking technology to be integrated into diesel trains for the first time. Furthermore, it can be tailored to
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suit various operating philosophies, including alteration of the engine demand to enable it to operate closer to its optimum brake specific fuel consumption, hence saving fuel and reducing carbon dioxide emissions. The system may also be configured to use stored energy to augment the peak acceleration of the vehicle and thus increase the operational flexibility of older rolling stock. Faster acceleration rates – as typified on more modern vehicles – allow for increased network capacity, hence enabling more rapid recovery from delays and minimizing consequential impacts across the network.

“While we are already evaluating the Kinergy in a commercial bus application, this project will be the first to deploy this very promising, cost-effective and efficient mechanical energy storage technology in a rail application," said Ricardo head of rail vehicle technology, Jim Buchanan. “Combined with the Artemis high efficiency hydraulic transmission technology and Bombardier’s established position as a leader in rail vehicle design and construction, I believe that this project has the potential to demonstrate a highly compelling fuel saving and performance enhancing solution, equally applicable to retro-fit installation or incorporation in new rolling stock.

“We believe that the Artemis Digital Displacement® technology is ideally suited both to railway driveline applications requiring highly efficient fluid power, and to use with an advanced mechanical energy storage system such as Ricardo’s Kinergy”, added Artemis Intelligent Power managing director, Dr Win Rampen. "We are extremely pleased to be working on this exciting project with two world-class partners."

"As a global rail technology leader, Bombardier is continuously looking to challenge and improve the energy efficiency of its products," said Paul Roberts, Bombardier chief country representative UK & Ireland. “We are proud to announce the collaborative project with Artemis Intelligent Power and Ricardo that aims to deliver a cost-effective solution to recover and re-use energy normally lost through braking on diesel trains – an industry first. The project will enable Bombardier to further support our customers in their continuing drive to reduce energy use and CO2 emissions and help towards supporting improvements in the long term operational viability of legacy diesel fleets."

The ‘Digital Displacement Rail Transmission with Flywheel Energy Storage’ project is a partnership between Artemis Intelligent Power Ltd, Bombardier Transportation UK Ltd, and Ricardo UK Ltd, with co-funding from the UK government-backed Technology Strategy Board.

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NOTES TO EDITORS:

Ricardo plc is a global, world-class, multi-industry consultancy for engineering, technology, project innovation and strategy. With almost a century of delivering value, we employ over 1600 professional engineers, consultants and staff. Our people are committed to providing outstanding value through quality engineering solutions focused on high efficiency, low emission, class-leading product innovation and robust strategic implementation. Our client list includes the world’s major transportation original equipment manufacturers, supply chain organizations, energy companies, financial institutions & governments. Guided by our corporate values of respect, integrity, creativity & innovation and passion, we enable our customers to achieve sustainable growth and commercial success. For more information, visit www.ricardo.com.

The Technology Strategy Board is a business-led government body which works to create economic growth by ensuring that the UK is a global leader in innovation. Sponsored by the UK Government’s Department for Business, Innovation and Skills (BIS), the Technology Strategy Board brings together business, research and the public sector, supporting and accelerating the development of innovative products and services to meet market needs, tackle major societal challenges and help build the future economy. For more information please visit www.innovateuk.org.

Bombardier Transportation is a global leader in rail technology, offers the broadest portfolio in the rail industry and delivers innovative products and services that set new standards in sustainable mobility. BOMBARDIER ECO4 technologies – built on the four cornerstones of energy, efficiency, economy and ecology – conserve energy, protect the environment and help to improve total train performance. Bombardier Transportation is headquartered in Berlin, Germany and has a very diverse customer base with products or services in more than 60 countries. It has an installed base of over 100,000 vehicles worldwide.

In the UK’s rail transportation industry, Bombardier Transportation UK is the leader in the manufacturing, refurbishment and maintenance of rolling stock and is the only remaining train builder in the country. Bombardier Transportation employs around 3,200 people at eight Bombardier-owned sites and 31 locations across the UK. Bombardier has delivered more than 5,200 vehicles in the UK (around one third of the UK’s existing fleet) and currently maintains around 40% of the UK’s rolling stock.

A world-leading manufacturer of innovative transportation solutions, from commercial aircraft and business jets to rail transportation equipment, systems and services, Bombardier Inc. is a global corporation headquartered in Canada. Its revenues for the fiscal year ended December 31, 2011, were $18.3 billion, and its shares are traded on the Toronto Stock Exchange (BBD). Bombardier is listed as an index component to the Dow Jones Sustainability World and North America indexes.

Artemis Intelligent Power Ltd performs research, development, and technology licensing associated with Digital Displacement® hydraulic power technology, and other innovations in the control and transmission of fluid power. Spun out of fluid power research at the University of Edinburgh in 1994, Artemis has grown steadily through its long term development projects with market-leading industrial partners. These partners' varied needs and applications continue to drive Digital Displacement® technology forward. Artemis is a diverse, multidisciplinary team of engineers and technicians with an international flavour. Artemis became a subsidiary of Mitsubishi Power Systems Europe in 2010.

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