Research, Development and Innovation
Quarterly summary
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Introduction

RSSB work to support delivering the vision of the Rail Technical Strategy to improve the railway, while continuing to support the industry by providing solutions to current railway problems and opportunities.

There are currently 105 research and development projects, 31 active technology development programmes and 12 Europe, Strategy and Change programmes comprising 83 innovator projects at different stages of development and delivery across the two teams, with a further 12 innovator projects currently being negotiated.

The following updates represent a selection of projects in our portfolio.

If you would like to find out more about any individual projects visit www.sparkrail.org and search for a key word or visit RSSB.co.uk
World’s first modular glass-fibre bridge

The world’s first modular glass-fibre, reinforced plastic bridge has been launched by Arup with part-funding from the RSSB Rail Innovation Support Engine (RISE) scheme.

The post-tension bridge is designed to be assembled in hard to reach sites where large cranes or heavy machinery cannot be used and is quick and easy to install helping minimise disruption to surrounding communities, reducing haulage and installation fees. The innovation, which is also funded by Arup Ventures Initiative, can be used for a range of purposes from rail foot bridges to road and river spans providing the rail industry with a safer alternative to level crossings where traditional pedestrian bridges cannot be installed.

The bridge modules are one metre in length and are light enough to be transported by an articulated lorry, assembled on site and lifted from a distance. The bridge is 70 per cent lighter than those made from steel.

The first bridge was installed by Network Rail at a site in Oxford and Mabey have been announced as the first licensed distribution partner, offering customers the bridge under the brand name PESESTA.

Closer Running

RSSB has recently published research on how to use closer running to enhance capacity on the GB rail network. The findings identify technology improvements needed to support the closer running concept including improvements to ERTMS Level 3 ‘moving block’, predictable braking, high-integrity switch technology, traffic control and train flow information.

The research has developed a structured implementation road map which will help the industry to safely reduce the separation between consecutive trains to enhance capacity on the network and meet growing demand.

‘As one of the key capabilities identified within the Rail Technical Strategy, closer running is expected to play an important role in shaping the railway of tomorrow and forms part of a natural progression beyond ERTMS Level 3 moving block.’

Clive Burrows, Director of Engineering, First Group (sponsor)
New automatic test device for pantographs

Pantograph dynamics test rigs already exist for characterising behaviour but none are suitable for use in an operational depot environment providing regular automated state-of-health monitoring via dynamics testing. But a new solution has been developed with part-funding from RSSB, the University of Birmingham’s pantograph dynamics test rig, which has been developed in collaboration with Computer Controlled Solutions Ltd (Kenilworth) and Motion Drives and Controls Ltd (Warwick).

The new pantograph test rig can be transplanted, used in a depot environment and can quickly identify where pantographs are not working properly. Using the test rig in depots enables the move towards a risk and condition based pantograph maintenance process, rather than having to rely on the traditional fixed or train mileage based maintenance interventions.

The University of Birmingham has submitted a proposal for the next phase of development to implement depot based rig systems which automatically assess the condition and serviceability of pantographs and provide recommendations for repair. With the support of the Vehicle/Traction System Interface Committee a working system is expected to be installed in a depot such as Bounds Green in London within 12 to 18 months.

Reducing risk of unplanned evacuations

RSSB has published two documents to reduce the risks associated with unplanned evacuations on trains.

The research report identifies and showcases good practice in the making of on-train announcements during incidents to help prevent unplanned evacuations. The updated Rule Book Module M1 ‘Dealing with a train accident or train evacuation’, instructs staff in dealing with an unplanned passenger evacuation, detailing the responsibilities of the driver, guard and the signaller when needed.

Trespassing onto railway infrastructure poses serious safety risks, both to the individuals involved and to the rest of the network.

The new guidance and standard will work towards reducing the risk of unplanned evacuations across the network, improving the safety of passengers and staff and reducing costs associated with delays.
Automatic vehicle identification system benefits

Building upon the findings of the RSSB project Cross-Industry Remote Condition Monitoring and Network Rail’s 2014 AVI operational trials, this project set out to assess the high-level case outlining how the GB rail industry could co-operate to benefit from and make best use of automatic vehicle identification (AVI).

AVI is a technology-agnostic approach that enables the identity, order, orientation and location of rail vehicles to be automatically captured and communicated to a point where they can be referenced against a list of known vehicles and be uniquely identified. AVI enabled insight can improve customer satisfaction and is a critical enabler for infrastructure based Remote Condition Monitoring (RCM) systems by removing the need for manual lookup processes and by improving the reliability of data assignment to individual components.

The research has encouraged industry to come together on the use of AVI and the findings have been used to support Cross Industry Remote Condition Monitoring Strategy Group’s submission for cross-industry AVI funding in Control Period 6 (2019 – 2024). The knowledge gained will help inform future decisions on the rollout of AVI across the rail industry.

‘The project has been made more successful by bringing together the subject matter experts from different parts of the industry and combining their input into a requirement and business case for developing an automated solution for capturing vehicle information.’

Nick Wilson, Technical Architect, Customer Information Strategy, Rail Delivery Group
Powertrain demonstrator

Chiltern Railways is helping to test an innovative powertrain demonstrator for self-powered rail vehicles, as part of a wider powertrain competition, funded by RSSB and Artemis Intelligent Power Ltd.

The Digital Displacement® Hybrid Rail Transmission project, using technology and expertise provided by Artemis and JCB, aims to reduce fuel consumption and improve engine performance by combining highly efficient hydrostatic transmission with on board energy storage in the form of hydraulic accumulators, which store energy during braking for reuse during acceleration. Stored energy can be reused to supplement engine power, reducing journey times through faster acceleration allowing trains to leave stations without producing emissions.

The technology could be applied to non-electrified rail routes where the case for future electrification is difficult to make. It also has the potential to provide benefits to the customer experience and to train planners in terms of reducing station dwell and journey times. The hybrid drive train can also be combined with an efficient downsized engine to reduce emissions and fuel consumption of the fleet.

Artemis Intelligent Power is planning to test the new solution on one of Chiltern Railways’ Mark 3 DVT vehicles. The test will take place for three months and is due to start in December 2017.
Launch of *Big Train meets Little Train* tourist guide

One of the winners of the Heritage and Community Rail Tourism Innovation competition, funded through RSSB, has launched a tourist guide called, *Big Train meets Little Train*, encouraging visitors to explore Wales by train.

The guide by Great Little Trains of Wales, was launched at Kings Cross station by Sir Peter Hendy, Chairman of Network Rail and Paul Lewin, Director and General Manager, Ffestiniog and Welsh Highland Railways, in front of one of the world’s earliest narrow gauge steam locomotives brought especially to the capital from its home in Wales at the Ffestiniog Railway in Porthmadog.

The vast majority of heritage railways and community railways are outside London and one of the main aims of the competition was to encourage more tourists to travel to destinations beyond the capital. Approximately 10 million people a year visit a heritage railway with the sector contributing an estimated £250m to the UK economy. Community rail lines account for around 40m journeys per year and are often rural based.

The free guide features eleven world famous Great Little Trains of Wales and their routes including a selection of travellers’ tales, suggestions of where to eat and sleep plus a guide to the hidden gems to be found along the way.

For a copy of the guide go to-
www.bigtrainlittletrain.com

Reducing luggage risks

RSSB has produced a guide for station staff and train crew to help limit the risks posed by luggage to both passengers and staff.

Luggage is one of the risks identified in the industry’s platform-train interface strategy. Luggage can fall down the gap between the train and the platform, or get stuck in closing doors. It can also create a trip hazard on stairs and escalators. Suggestions from the research include designing overhead compartments to accommodate standard airport hand luggage and using cantilever seats (fixed to the side of the train rather than to the floor) so larger items of luggage can be stored underneath improving capacity. Reducing the risk will help improve the safety of passengers and staff plus reduce liability costs.
Six innovation projects set for funding in TOC’16 competition

The RSSB Innovation Programme has announced the winners of its Train Operator Competition 2016 (TOC’16) who can now take their projects forward to the next stage of development.

A key barrier to innovation within the rail sector is the ability of train operating companies to engage effectively with the rail supply chain. The TOC’16 competition is designed to encourage greater collaboration between both, challenging them to work together to develop new and innovative ways to improve performance, reliability and safety on the railway while enhancing the customer experience.

Funded by RSSB, the £4m competition enables the winners to move their projects into the delivery phase, subject to contract.

The selected projects include new ways to manage service disruption and station overcrowding including the use of wearable technology to understand customer wellbeing throughout their end-to-end journey.

The projects:

Intelligent Gate Lines – Led by Cubic

This project will develop and operationally demonstrate a gate line capable of automatically self-reconfiguring to maximise peak and average throughput and prevent station overcrowding. The technology will identify flows of people within the station environment, learning to predict crowds before they arrive at the gate line. Developed in partnership with Arriva, Cubic, TfL and the University of Portsmouth.

TOC Ability – Intelligent Accessibility Hub
– Led by Enable iD

TOC Ability is a digital platform concept connecting the train operator and service provider systems to bring improvements to train journeys for disabled customers. The project in collaboration with Arriva, Enable ID, TFL, Atkins, GOSS Consultancy, University of Surrey and Loughborough University, will facilitate the sharing of disabled customers’ travel requirements with train operating companies, bus and taxi firms, food and beverage retailers through an intelligent accessibility hub.

Platform Train Interface Training using a Computer Augmented Virtual Environment (CAVE)
– Led by VR Simulation Systems Ltd

The aim of this project is to reduce the number of incidents at the platform-train interface to create a safer environment for the travelling public and for people working on the railway. The CAVE simulator, in association with Arriva Trains Wales and VR Simulation Systems Ltd, will enable train-crew and station staff to receive training and development in a virtual reality station environment.
Customer experience

Stress Free Northern Journeys – Led by Thales UK

Stress-free Northern Journeys uses wearable technology in the form of fitness and activity trackers, to monitor the stress levels of volunteers (including rail customer and front-line staff) to better understand passenger wellbeing throughout their end-to-end journey. The consortium includes Arriva Rail North, Thales UK, Saturn Visual Solutions and Robertson Cooper Ltd.

Enhanced Timetable Management – Led by Resonate Group

Abellio ScotRail in collaboration with Resonate Group will investigate how the operator manages unplanned service disruption focusing on adverse weather conditions. The project will look at tools to enable rapid changing of timetables in the event of disruption using existing agile processes along with newly available machine learning techniques capable of processing significant amounts of data in a shorter period of time.

Towards the Inclusive Railway – Led by Siemens Rail Automation

The aim of this project is to improve the customer experience for elderly rail passengers and those who suffer from multiple minor impairments to vision, hearing, cognitive ability, reach, stretch, dexterity and mobility. Siemens Rail Automation will lead the consortium, including Keolis Amey Docklands and the University of Cambridge and Astutim, to identify the barriers to inclusive transport and the remedies that can be delivered through the development and application of innovative technology.

‘The TOC’16 competition has been designed to help operators and suppliers work together to improve the railway by finding solutions to TOC business challenges which will have a direct or indirect benefit to the customer.’

Neil Webster, Innovation Programme Director, RSSB
During a recent industry event in Birmingham, experts unveiled the Railway Capability Delivery Plan (CDP). The CDP identifies twelve areas for improvement to meet the objectives of carrying an increasing number of passengers, while also improving customer service - safely, affordably and sustainably.

The CDP approach has been endorsed by the Rail Supply Group and the Rail Delivery Group and is led by the industry Technical Leadership Group (TLG) on their behalf.

Key RSSB research, design and technology projects supporting the plan include:

- A mobile app that uses Bluetooth technology to aid the flow of passengers through ticket gates
- New seat designs to improve comfort and increase customer capacity in carriages, helping to minimise overcrowding
- Trialling new signalling technology to allow trains to communicate with each other, ensuring maximum efficiency with trains running closer together safely.

“We are pleased that the delivery plan has been issued, but now comes the hard work of bringing the industry together to make the plan a reality.”

Guy Woodroffe, Head of Rail Technical Strategy and TLG Programme Manager, RSSB
Bluetooth low energy fare validation technology

The first demonstration of the ByteToken ticketing mobile app, designed to aid the flow of passengers at fare gates using Bluetooth LE technology, has recently been held at Thales UK.

The successful demonstration, attended by members of the rail industry, showed the Bluetooth gate in operation in several different scenarios. Branded Keypass, the demonstrator combines a commercially available 3D camera with an array of sensors able to detect mobile devices where an m-ticket has been activated. The sensors can detect via Bluetooth valid m-tickets, associate them with a given individual approaching the gate line, and then open the gates to allow the passenger through.

Funded by RSSB, the Bluetooth detection, customer location and back-office software has been developed by ByteToken, the UK subsidiary of m-ticketing technology specialist Bytemark. The demonstrator uses a novel ticket gate designed by Thales featuring a gantry-mounted 3D camera to track passengers through the gate.

The aim is to increase station throughput as passengers can pass through the gate line easily without needing to physically present a ticket or device at a fare collection reader - resulting in greater efficiency and an improved travel experience.

The innovation came from the RSSB Future Ticket Detection competition which sought alternatives to existing gate line and ticket detection systems.

Launch of R2 integrated database

A new integrated database, named R2, has launched replacing the Rolling Stock Library and Rail Vehicle Records System.

Funded jointly by RSSB and ATOS, the web-based database includes new functionality to improve the efficiency and effectiveness of recording information for rolling stock maintenance and planning, component tracking and defect recording.

The application can reduce operating costs with a predicted reduction in subscription charges paid by current users of the system from £1.8m to £1.1m per year.

R2 will avoid the need for companies to purchase or develop their own systems and will enable the easy exchange of data between existing company databases and the new one.
Rail industry embraces Platform Train Interface Risk Tool

RSSB’s Platform Train Interface (PTI) Risk Assessment Tool has now been implemented for use by 10 TOCs and Network Rail major stations.

This positive uptake highlights the value industry sees the tool can bring in the assessment and mitigation of risk at the platform train interface. As a result, RSSB has undertaken an extension to the project to increase the IT platforms where the tool can be used and make it available to an even wider user base.

The web-based and mobile application is available to download in Google Play, the App Store and via the Windows App Store. The tool allows users to complete assessments on the platform in real time. Information can be collated anywhere on a platform and then synchronised with the tool using a Wi-Fi connection.

Anyone responsible for carrying out platform risk assessments who wishes to use the web tool will need to email enquirydesk@rssb.co.uk to obtain a login and password to the system. Once they have access the app can be downloaded and used in conjunction with the web tool.

‘Preventing injuries relies on the industry’s ability to better understand what causes them. Companies managing mainline stations will now be able to share a common, transparent approach to sharing information and prioritising work to make stations and platforms even safer.’

Allan Spence, Chairman, PTI Strategy Implementation Group