SBRI: First of a Kind (FOAK) 2023 competition winners (DfT)

1626 – SBRI: FOAK 2023 – Customer Experience Rail Demonstrations

Application Number	Project Title	Lead	Project Cost
10089076	Now and Next	ZIPABOUT LOCAL LIMITED	£290,225

Public synopsis
Complex journeys involving public transport can be stressful and difficult, often provoking a high level of anxiety that can act as a barrier to travel. This project will trial our unique 'Now and Next' approach to journey information, providing passengers with just the right information, at just the right time.

Public description
Now and Next - a clean and simple way to move through the World.

Journey information should be "As simple as possible, but no simpler".

We believe in a simple philosophy that keeps you in the moment - telling you what you need to know Now, and what Next.

Complex journeys involving public transport can be stressful and provoke a high level of anxiety that can act as a subconscious barrier to travel. This anxiety surges every time the passenger is required to change trains, buses or platforms. Often this requires navigating unfamiliar rail and bus stations under time pressure, relying on station signage or kind-hearted locals, both of which can be hard to find. For accessibility audiences and in particular the cognitively impaired this is especially difficult.

Our proposition focusses on the timely delivery of simply packaged live information designed to provide a first-time user with the local knowledge and nous of a seasoned commuter. We focus on making information easy to absorb and tailored to your needs and preferences. The goal is to help reduce potential anxiety for ANY traveller at the point of maximum stress - railway and bus stations.

We are uniquely qualified to deliver this effectively, having spent many years delivering journey information in the rail environment, and in parallel further developing robust and effective systems and assets that make it easier for the cognitively impaired to travel on the UK railway.

We have developed a proprietary journey information methodology. "Now and Next" features our unique iconography originally developed and tested with the accessibility audience, combined for the first time with minimalist map of the interchange area including rail, bus or tram connections. This layer is tailored to you and your journey needs, highlight relevant timetabled services and nearby services, adjusted for real-time platform alterations and delays, delivered to the device of your choosing.

Our system has been designed to reduce the anxiety of those most sensitive in our society. We believe that properly tailored and combined with useful resources such as real-time railway data and local station schematics, this approach can be made effective for the mass market. Now and Next, with its emphasis on clear, simple information, effectively delivered at the point of need, we believe is a deliverable mantra that could make a material contribution to the railway travellers experience -- whoever they are.

Application Number	Project Title	Lead	Project Cost
10087210	EcoSeat - The Worlds First 100% Recyclable Rail Seat without Polyurethane Foam	SPINKO LIMITED	£299,485

Public synopsis

Rail seats are becoming more uncomfortable as regulations and interior design requirements clash. This project will develop a sustainable alternative to foam-seat-cushioning, adapting proprietary low-height, recyclable pocket-spring modules. The resulting solution will be trialled in static/dynamic rail environments to meet safety standards and exceed comfort and value for money requirements.

Public description

Rail seats have been criticised for being uncomfortable, even over short journeys. Interior design looks to reduce seat profiles but often at the expense of comfort, as the foams used for cushioning need to be reduced in depth, with hardening agents to improve their safety compliance. Foam is petroleum-derived and emits toxins during its lifecycle. This project seeks to eradicate its use in rail seating whilst improving on its performance characteristics.

EcoSeat will use combinations of low height pocket springs, designed to meet the load cases experienced in rail, to provide a more comfortable seat, that exceeds current standards at a cost-effective price point. The project utilises Quantum Seating's design and rail experience in proving durable seats with less than half the emissions of current materials, with second life materials coming from its 100% recyclability.

Application Number	Project Title	Lead	Project Cost
10089927	ChapARone: No-code Augmented Reality CMS with location-based WebAR/AR for Stations	GAZOOKY STUDIOS (IMMERSIVE STORYLAB) LTD	£293,192

Public synopsis

ChapARone is an end-to-end Augmented Reality (AR) solution designed to aid disabled passengers throughout their train journeys. The user-friendly, no-code Content Management Platform allows station staff to easily upload, update, and manage information. Passengers can then access this information on their mobile devices.

Public description

ChapARone is an end-to-end Augmented Reality accessibility tool, to help disabled passengers when travelling by train. It starts with a user-friendly no-code Content Management Platform which means station staff can upload and control information, all around the station, at the click of a button. And it ends with the passenger getting information all over the station. So now, you don't have to watch the Information board to check for delays or changes to platforms -- all that information will be available by accessing a web of multiple AR-points, and Accessible QR codes, in every part of the station.

It's designed to improve accessibility for people with disabilities, but it'll make travel more convenient, more pleasurable for everyone. Passengers will be able to access AR moments station-wide, on their own smartphones, to trigger location-relevant information, fun activities and way-finding facilitation. The AR might be pop-up texts, videos, infographics, or even a companion avatar, to mediate the rail-journey for you, give information, or even interact with fun stories.

And the brilliant and unique thing is that station staff can change any of this AR content easily, in near-real-time, thanks to our proprietary AR Content-Management-System. This system gives clients control - think of it like a no-code solution for AR.

Creating and changing the AR content couldn't be easier. It's web-based -- using all major browsers. It's really intuitive - Content can be updated by anyone, needing no technical ability. It's no harder than filling in boxes and copy-and-pasting links.

So stations can turn their own data-sets, or any non-AR information, into AR-content to make travel for disabled people less stressful and more enjoyable.

For instance, station staff could use the system to add AR content about:

Platforms -- way-finding graphical layouts of the platforms, which are visually engaging,
Trains -- passengers can engage with layout, seating, facilities etc
Time-tables -- can be updated
Delays -- notifications with live delay information.
Hospitality information -- where to locate refreshments, toilets, help desks, meeting points, lifts etc.
This project won't just benefit disabled passengers, it will bring financial stability and added revenue to the railway industry, bringing many more passengers back to train travel, through improved customer experience. And it will empower station staff to communicate easily with their passengers. Now Augmented Reality can support disabled passengers, and indeed all passengers, to make travel so much easier and more enjoyable.

Application Number	Project Title	Lead	Project Cost
10085867	National Request Stop	COMMS DESIGN LIMITED	£223,215

Public synopsis

National Request Stop allows passengers to request a train to stop via a novel platform kiosk system rather than manually flagging down services. This new system will offer the travelling public a greatly enhanced passenger experience at rural request stop railway stations.

Public description

Request Stops are rural railway stations where passengers have to request a train to stop by making themselves visible to an approaching service whilst putting their hand out to indicate a wish to board. All passenger trains passing these stations have to slow to low speed to be able to stop safely in case passengers are waiting, which can be infrequent at lightly used stations. Sometimes passenger's requests are not successfully acknowledged causing a major inconvenience to the travelling public, and disruption to the operation of the railway through station overruns or 'failure to call' incidents.

National Request Stop (NRS) is a novel system designed to eliminate these problems. From the perspective of a passenger, NRS provides a platform kiosk displaying service information and a push button to request a service stop, offering a simple to use system with improved travel information.

NRS also improves the safety of waiting passengers by removing the need for them to stand near the platform edge to flag down the train manually. This issue is of particular concern at unsighted stations (stations that are on a bend, in cuttings, bridges obstructing the platform etc.) where the driver does not have a clear view of the platform on approach.

NRS gives the train crew advance notice of waiting passengers meaning the service can pass through at line speed when no one wishes to board. This leads to reduced delays and better timetable resilience, reduced fuel use and brake wear by trains and better passenger information, interaction and safety as passengers now only need to press a button to request the train to stop.

NRS does not need additional equipment installed on trains and uses existing data feeds and communication channels to determine the position of the train in relation to the station and to alert train crew of an upcoming stop.

NRS is a game changing upgrade to the service provided to passengers at request stop stations as it can potentially enable the reopening of closed stations, due to the low timetable impact that NRS offers. The system is designed for lightly used stations in remote or rural areas and offers an extremely cost effective intervention which re-affirms a commitment to support rural communities by enhancing the travelling experience in these areas.

Application Number	Project Title	Lead	Project Cost
10085900	DreamSuite: Redefining Train Travel with Unprecedented Versatility	FUTURE TRAVEL STUDIO LTD	£275,185

Public synopsis

DreamSuite is an innovative train seating concept for sleeper trains and long-distance day trains. DreamSuite premium seats when retrofited to existing rolling stock, maximise space utilisation, enhance the overall travel experience, stimulates rail growth, and supports the transition to sustainable travel by reducing the operational cost of sleeper services.

Public description

Our project, DreamSuite, aims to transform the railway industry with an innovative new seat concept, initially for UK Sleeper Services, inspired by the comfort and flexibility found in aviation. This ground-breaking seat design not only caters to overnight journeys but also has the potential to be extended to long-distance services and European and Global rail services.

The primary objective is to address the shortage of sleeper trains by developing a transformative seat solution that can be implemented on existing rolling stock - preventing the costly construction of small volumes of sleeper railway carriages, and allowing existing rolling stock to have an alternative use. Our new seat concept maximises comfort and offers commercial efficiencies and flexibility, providing customers with seating arrangements that meets their travel needs.

Customers will enjoy a personal and spacious seating environment with the DreamSuite which provides a level of comfort akin to premium airline experiences, allowing passengers relax, work, or socialise.

Our project aligns with the broader vision of transitioning to sustainable travel modes by encouraging more customers to choose rail travel over other transport options - it does this by optimising the carriage layout allowing more sleeper customers per rail vehicle, and ultimately improving the commercial proposition for sleeper services by reducing the operational cost of sleeper services.

The optimised carriage layout increases customer density over existing sleeper rolling stock, meaning that shorter train formations can be used to provide slipper services - opening up new markets for the operators of sleeper services to explore, or reducing the operational cost of existing sleeper services.

The introduction of DreamSuite represents a significant step forward in transforming the railway industry and enhancing the customer experience. With its exceptional comfort and flexibility for both sleeper and daytime services, DreamSuite sets a new standard of personalised comfort and convenience in long-distance rail travel.

"With DreamSuite, you are in control of your comfort, allowing you to make the most of every moment during your journey."

DreamSuite opens a world of possibilities, providing a sanctuary where customers can unwind, be productive, or connect with fellow travellers. DreamSuite will transform the customer experience and opens up new operational opportunities and markets.

DreamSuite is set to redefine train travel, bringing a new level of comfort and flexibility to the railway industry.

Application Number	Project Title	Lead	Project Cost
10087409	AccessRail- empowering the untapped market of disabled rail passengers to travel independently	SPOKEN INK LIMITED	£295,892

Public synopsis

AccessRail aims to provide a journey planner for passengers needing to use accessible facilities. The planner will use live data to allow disabled passengers to plan travel while ensuring their needs are accommodated. AccessRail will be a key tool for planning independent travel without relying on rail staff.

Public description

The unknown status and location of features such as lifts and accessible toilets impacts the confidence to travel of both the elderly and passengers with accessibility needs.

Whoosh media have established themselves as market pioneers in providing Personalised Real Time Information (PRTI) for passenger journeys. During development and deployments of our PRTI system, key failings in meeting needs of rail users that require accessibility options were abundantly apparent. The lack of accurate, reliable information on both train and station access dissuades many disabled people from using a key form of transport. Failings of accessibility cause irreparable reputational and significant financial damage such as the high profile case of Paralympian Wafula Strike's experience attempting to find an accessible toilet in 2016. The unknown status and location of necessary facilities significantly impacts the confidence to travel of both the elderly and passengers with accessibility needs.

The Whoosh-developed AccessRail system will be a a new vital tool designed to 1) enable independent travel for those with access needs, and 2) be used as a tool to manage key elements of train and station function maintenance.

This intelligent, interactive rail journey planner will adaptively meet access needs of customers, utilising real time information to best fit a travellers needs to their intended journey. Both staff and passengers will be able to easily update a live database containing the location and status of access provisions via Whoosh's QR code platform. Great British Railways Transition Team (GBRTT) support this proposal by giving access to data from a station audit commissioned by the DfT. This generated significant data on station assets. Whoosh's proposal will for the first time exploit this data set and make it available to customers.

The tool will allow for passengers and staff alike to see the status of any and all access provisions on a journey. It will help them adjust routes planned to meet the needs of an individual passenger. Critically, it will improve the travel experience of an underrepresented group.

Application Number	Project Title	Lead	Project Cost
10086265	Using AI to transform the Deaf customer experience: a mobile solution	SIGNAPSE LTD	£253,057

Public synopsis

We are creating a mobile-based solution that uses AI to translate timetable, on-board and in-station information into British Sign Language. Designed to transform the customer experience for Deaf passengers, it can be integrated into any train operator mobile platform. Our project partners are Network Rail, South Western Railway and Whoosh.

Public description

Signapse uses AI technology to bridge the communication gap between Deaf and hearing communities. We are building software that automatically translates from written text to Sign Language video delivered by a photo-realistic digital signer, indistinguishable from a human. Our mission is to ensure the global Deaf community can have the same access to information as their hearing peers.

There are an estimated 70m Deaf citizens globally and 300 sign languages in use around the world. British Sign Language (BSL) is used by more than 150,000 people in the UK and is the preferred language for over 87,000 Deaf individuals. For most of them, English will be a non-native second or third language. By using our AI technology to dramatically increase the amount of information available in sign language, we can improve the access that Deaf people have to key services, like transport, in a way that represents significant value for money.

We want rail travel to be accessible to Deaf passengers at every stage of their journey. The goal of our project is to create a mobile-based solution which allows Deaf passengers to access national rail timetabling information, in-station announcements and on-train journey information in their native language: British Sign Language. By making this available through API, our solution can be integrated into any digital platform; any train operating company or rail organisation can then utilise this to improve access for their Deaf passengers in a way that is cost-effective and does not require them to procure additional materials such as display screens or subscription to an additional app.

During this project we are working with Whoosh, a transport technology innovator, to make our solution available on-demand within their own mobile dashboards; these are accessed via QR codes displayed either in-station or on-train. We are supported by our partners Network Rail and South Western Railway in the testing and demonstration of our first-of-a-kind solution.

Application Number	Project Title	Lead	Project Cost
10088536	Luna: your personalised BSL guide	GOMEDIA SERVICES LTD	£250,767

Public synopsis
Luna is your personalised British Sign Language (BSL) avatar. Bringing BSL to passenger's own device from wherever they are during their journey, giving them live delay and departure information, station information and facilities, wayfinding and station announcements through Luna, your own personalised AI powered BSL avatar.

Public description
With your own personalised digital sign language avatar, accessed through your own device, British Sign Language (BSL) is finally being treated as an official language by public transport operators. Giving BSL users the opportunity to access station information, station announcements and even wayfinding information in BSL. This technology can be easily expanded to on board vehicles as well, providing full personalised BSL guidance during the passenger's journey.

Application Number	Project Title	Lead	Project Cost
10087799	Real-time on-board transcription of live audio announcements in trains	TELEVIC UK LIMITED	£156,665

Public synopsis
The "Real-time on-board transcription of live audio announcements in trains" project aims to enhance passenger experience by providing real-time subtitles of announcements. Using lightweight offline speech-to-text and NLP models, it improves transcription accuracy and addresses accessibility challenges. Televic GSP leads the project, bringing extensive rail industry expertise.

Public description
Increasingly more passengers don't capture audio announcements on trains. Passengers might have missed the announcement due to hearing problems, distractions, background noise, ... As a Passenger Information System provider, Televic GSP aims to provide all passengers with the latest, most correct information possible. To also include passengers with hearing problems, distracted passengers or non-native speaking passengers, the current research into live audio announcement captioning by Televic GSP provides the auditive public announcements visually on passenger information screens. The off-line, on-board solution transcribes the announcement made by train personnel and visualizes it as real-time subtitles on passenger information screens distributed throughout the railway vehicles. An initial feasibility study was demonstrated in collaboration with TransPennine Express on board the Manchester Airport - Edinburgh train in March 2023. However, to further improve the accuracy of the real-time subtitling more research is still required.

This project researches ways to improve the initial version of the speech-to-text solution to bring the transcription to an acceptable quality for passenger information systems. Current State-of-the-art speech-to-text models near 90% to 95% word accuracy. However, this accuracy is achieved on general spoken text. When transcribing railway public announcements the accuracy drops significantly, specifically for key words such as station names or branding specific words: e.g. Hitchin vs. kitchen; Transport for Whales vs. transport for wales, ... During this research project Televic GSP will research off-line light weight natural language AI models to further improve the transcription accuracy, specifically for key-words such as station names, alerts and branding.

Televic GSP specializes in on-board information systems for trains and focusses on two types of communication: passenger information systems and train monitoring, control and safety. The passenger information systems division designs and maintains systems for reliable, real-time and relevant information to passengers. Televic GSP develops vertically integrated solutions that combine hardware, software and services to large train builders and train operating companies. These solutions handle everything from wayside information management down to the passenger and driver communication on the train. Televic GSP has more than 35 years of experience in the rail industry and more than 60 000 vehicles worldwide use on-board passenger information technology from Televic GSP. In the UK this includes train operating companies such as: Transport for Whales, Northern Trains, TransPennine Express Limited, Govia Thameslink Railway, Eurostar, ...

1628 – SBRI: FOAK 2023 – Optimised Train Operations Rail Demonstrations

Application Number	Project Title	Lead	Project Cost
10089519	Rapid Creation of Optimised Train Timetables Rail Demonstrations	CFMS SERVICES LIMITED	£218,352 (Note: updated cost)

Public synopsis
CFMS is proposing a unique tool for rapidly optimising train timetables during extreme weather events using novel, distributed optimisation and high performance computing. The project will collaborate with GWR & Avanti West Coast to develop, evaluate and demonstrate the benefits of the tool to a wide reaching audience.

Public description
CFMS is proposing to deliver and demonstrate a unique tool for rapidly optimising train timetables during extreme weather events, delivering a step change in the way in which train operating companies respond to the increasing occurrence of extreme weather. The project will collaborate with GWR & Avanti West Coast to develop, evaluate and demonstrate the benefits of the tool.

When extreme weather such as heat waves or heavy rain and flooding are forecast, temporary speed restrictions and line closures are imposed on parts of the network, typically with a few days' notice. This leaves planning teams only 24 to 48 hours to adjust timetables, putting a strain on resources leading to the creation of sub-optimal timetables, resulting in a reduction in service and financial penalty payments being incurred.

CFMS proposes utilising parallel, distributed optimisation techniques coupled with high performance compute systems to perform automated timetable optimisation. This will use CFMS's robust timetable optimisation technology developed and validated on representative data on several projects including in the rail sector. The tool will run a very large number of possible timetables in parallel using high performance compute facilities allowing an optimal set of timetables prioritising different goals to be determined. An API will be developed to allow easy use of the tool and integration with other systems.

The tool will be developed with close collaboration with train operating companies, including GWR & Avanti. Using real data it will evaluate and demonstrate to a wide reaching audience the transformational efficiency, performance improvements and large scale savings that the tool is capable of delivering for the rail sector.

Application Number	Project Title	Lead	Project Cost
10087509	The Leaves on the Line Track Sensor - RAMAN 4 the Railways	PLASMATRACK LIMITED	£398,805

Public synopsis

The Leaves on the Line Track Sensor RAMAN 4 the Railways tackles the costly issue of leaves on tracks during Autumn. To combat this, PlasmaTrack proposes using RAMAN spectroscopy sensing, an innovative technology to measure, analyse and predict railway conditions enabling pre-emptive mitigation and stop 'Leaves on the line' delays

Public description

The Leaves on the Line Track Sensor RAMAN 4 the Railways

UK societal cost of 'Leaves on the Line' delays has been estimated at £355million annually. This includes cost of cleaning and maintenance of the tracks during the Autumnal season, as well as delays & chaotic changes to autumnal timetabling.

Leaves fall on and around the track and as the train passes its aerodynamic effect deposits more leaves onto the railtrack. When the train passes over the leaves, the wheels compress them into a paste, with a force of around one gigapascal (30 tonnes a square inch), between the wheel and track. The leaves are transformed into a black teflon-like surface (called a 3rd layer contaminant), that's bonded to the track surface. This super slippery layer reduces grip, meaning trains need to accelerate and brake gently to avoid slipping. This problem can also be created by other contaminants , such as grease, oil, fuel & corrosion.

There is currently no system for sensing/ measuring the railtrack condition in real-time. This information would be invaluable for many different aspects of the UK railway running; including Network Rail Seasonal track cleaning teams, timetable schedulers, and train drivers. RAMAN sensing is used in chemical & pharmaceutical industries to analyse material compounds. PlasmaTrack, with support from the National Physical Laboratory, has been using this sophisticated system to analyse and develop simulants of the leaf layer in its laboratory. This has been used to help it in the development of its plasma track cleaning system. Having discovered this innovative technology which can analyse any chemical compound, PlasmaTrack has been able to characterise the key components in the leaf layer. It is proposing to develop the technology specifically tuned to railway leaf layer and other low adhesion contaminant signatures. This project will further optimise it for the railway environment; by limiting the scanning to the specific signatures will enable more rapid analysis which will lead to a product for fast diagnosis track side and on-board sensing to aid with driver feed-back and braking control.

With the number of passenger journeys doubling over the last 20 years, the UK rail network is at maximum capacity. This sensing system will lead to the ability to run more trains on the UK network with Closer Running through predictable and optimised braking. This First of A Kind technology is key to unlocking the unrealised capacity of the UK Rail Network.

Application Number	Project Title	Lead	Project Cost
10090368	SPEED - Speed Profiling & Enhanced Efficiency Determination	INCREMENTAL SOLUTIONS LTD	£388,798

Public synopsis
The industry is under increasing pressure to improve performance, but increasing capacity demands cause further subthreshold delays to accumulate.

Incremental Solutions and Amey Consulting propose integrating AEGIS and SPRINT to overlay speed restriction data with speed profiles to understand the impact of speed restrictions and driving techniques on performance.

Public description
Incremental and Amey will bring together their skills and solutions to develop SPRINT. A first of a kind look into the granular detail of performance inefficiencies caused by speed restrictions.

SPEED will integrate existing data from Incremental's AEGIS and Amey's SPRINT solutions to overlay speed restriction data with speed profiles for differing class units to understand the impact speed restrictions can have on sectional running times, but also to identify where performance initiatives could be put in place to improve overall performance of the network.

To do this, Incremental and Amey will combine to-the-second berth-level information, accurate GPS movement data, train descriptor information and the live possession planning database to fully map train movement across the network.

The large array of detailed data shall allow users can accurately identify:

Which speed restrictions are causing the most impact to performance on a cumulative basis,
How speed restrictions affect differing class differently
How acceleration and deceleration vary at different speed restrictions,
Which speed restrictions cause the most knock-on effect to the timetable,
How driving technique differs amongst the fleets.

In addition to allowing users to accurately identify locations causing the largest impact, it will provide rail colleagues with all the necessary information to proactively mitigate these issues and optimise performance.

Application Number	Project Title	Lead	Project Cost
10090014	DataSim: A Machine Learning-powered simulation tool for rail timetable optimisation	DISTRIBUTED ANALYTICS SOLUTIONS LTD	£297,327

Public synopsis
DataSim, powered by machine learning, empowers Rail Operators to develop robust timetables using an intuitive geo-interface. DataSim simulates network-wide delay impacts with station-level granularity. This is the first public venture for a tool that unlocks radical change, offering a scientific platform for simulation and enhancement of every UK rail dataset.

Public description
This project will deliver a Machine Learning powered simulation tool called DataSim, to empower rail operators with the ability to explore the impact of timetable changes on the network state. With DataSim, operators could simulate different scenarios and find the optimal solutions for efficient and reliable rail scheduling. DataSim uses a map interface which intuitively depicts rail asset position. Through this, rail operators can view the differences between planned and actual train positions, analyse the time lost or gained at each section of the journey, and view the arrivals and departures for each station on the network. This allows rail operators and decision makers to take a scientific approach to data analysis, mitigating management problems by empowering analysts to visualise and simulate services and the cascading impacts of unexpected delay scenarios including weather, trespass incidents, hardware failure, and other unforeseen circumstances.

1629 – SBRI: FOAK 2023 – Reliable and Maintainable Assets Rail Demonstrations

Application Number	Project Title	Lead	Project Cost
10085502	FOAK 23 | Atmo Smart Depot & Asset Savings | Creating a digital twin tool to identify under-performing assets	ATMO TECHNOLOGY LTD	£246,717

Public synopsis
Creating a real time digital twin for rail depots. By deploying internet connected sensors to augment data already generated we will create a digital representation of rail depots. Having a digital copy allows algorithms to find optimisations and gives depot managers an overview of asset performance on site.

Public description
FOAK 23 | Atmo Smart Depot & Asset Savings | Creating a digital twin tool to identify under-performing assets

The Problem: Rail depot managers face a significant challenge -- they lack access to real-time data necessary for making informed decisions to optimise depot operations fully. Data is scattered across various platforms, making it difficult to gather valuable insights. Additionally, much of this "dark data" remains unused, hiding answers to questions that could optimise depot operations and improve maintenance of essential assets including rolling stock.

Our Solution: We envision creating a smart depot by integrating existing datasets with data collected from newly deployed IoT sensors collecting energy usage, GPS, machinery vibration, air quality, noise and more. This integration will generate a digital twin of the depot, providing decision-makers with an overview of everything happening on site. This data will be distilled into Key Performance Indicators (KPIs) and metrics that provide valuable insights to improve operations effectively.

Innovation at Its Core: AtmoCore Smart Depot stands out due to its seamless integration of multiple technologies into one easy-to-use platform. Our data- and hardware-agnostic approach ensures compatibility with existing infrastructure, able to use any IoT protocol.

A key innovation lies in our practice of data fusion, where we combine multiple datasets to identify new trends, patterns and links between disparate datasets, finding insights that are only possible when you look at the whole picture. This analysis allows us to develop algorithms that produce meaningful KPIs, enabling depot managers to assess the depot's performance at a glance.

Benefits to Rail Freight Industry:

Cost Savings: By optimising depot operations and asset utilisation, AtmoCore will lead to significant cost savings for Network Rail, SWR, and other operators.
Environmental Sustainability: The platform's ability to monitor energy, fuel, and water usage, along with air and noise pollution, will help reduce emissions and give depot managers control over environmental impact.
Improved Decision-making: With real-time KPIs and insights, depot managers can make informed decisions to enhance operational efficiency and safety.
Operator-Agnostic Solution: AtmoCore is designed to be deployable across multiple Train-Operating-Companies (TOCs) and Freight-Operating-Companies (FOCs), ensuring wide industry applicability.
Why Atmo: With a proven track record, Atmo is uniquely positioned to bring innovations from other industries into the rail sector. Our team of data scientists and software engineers are experts in extracting value from untapped data sources, delivering maximum value to our clients.

Application Number	Project Title	Lead	Project Cost
10088085	DepotMATE - Multi-sensor Automated Train Examination	ONE BIG CIRCLE LTD	£393,922

Public synopsis

DepotMATE will be a multi-sensor trackside capture solution which aims to enhance safety and cost-efficiency across rolling stock inspections within depots. Transmission of critical data captured and applied Machine Learning will enable operators to deliver cost-effective predictive maintenance and optimisation of depot operations through targeted, remote examination.

Public description

This project and the delivery of the DepotMATE (Multi-sensor Automated Train Examination) solution aims to meet the safety and efficiency challenges associated with depot-based rolling stock inspections. The diverse and congested UK rail network relies on efficient depot operations to ensure passenger, freight, light and heavy rail services run safely and on time, with high-performing assets. With the vast volume of inspection scheduling required to ensure assets are operating effectively, traditional manual examinations require a large amount resource, coming at a cost to both the operator and passenger where services are impacted by depot delays. This project collates a host of technologies incorporating sensor-fusion, advanced Machine Learning, and One Big Circle's industry-leading Intelligent Video expertise to enable operators to remotely examine a multitude of asset conditions in a reduced timeframe.

The DepotMATE system will incorporate a multi-sensory lightweight inspection system, deployed to depots or sidings and positioned to capture passing rolling stock vehicles. Combining thermographic, acoustic, and Forwards Facing Video cameras and sensors and additional transmission of train-borne data via edge-processing, the DepotMATE will simultaneously capture a plethora of critical data as rolling stock vehicles pass by. A 'plug & play' design will enable partnering operators to configure sensors for their specific units, effectively targeting each operator's examination requirements and necessary inspection zones. DepotMATE will arm operators with automated monitoring data across a breadth of rolling stock, to assure cost-effective delegation of resources when managing depot operations, and successful delivery of proactive maintenance, helping to reduce costly reactive repairs and optimise the maintenance of rolling stock assets.

DepotMATE will assist further automation across rolling stock inspection activities through the application of Machine Learning models, to automatically detect visibly apparent faults/vehicle contamination, exceedingly hot components, and acoustic emissions which may signify defective wheels or braking systems.

Data will be accessible in extremely low-latency online, via One Big Circle's Automatic Intelligent Video Review (AIVR) platform, to enable depot operatives, control units, and fleet managers to remotely inspect each vehicle within their depot. Aspects of vehicle cleanliness, asset status, and vehicle allocation within a depot will be presented to the project's partnering operators at the touch of a button, massively reducing requirements for personnel to walk trackside whilst empowering users to inform predictive maintenance decisions.

Application Number	Project Title	Lead	Project Cost
10089349	Wireless sensing for rolling stock condition monitoring	INSTRUMENTEL LIMITED	£154,656

Public synopsis
Instrumentel Ltd. (a Unipart Technologies Group company) is leading a project to help the rail industry reduce asset maintenance costs and extend asset service life. The innovation will focus on solutions to reduce the time and cost barriers associated with the installation of condition based maintenance (CBM) technologies.

Public description
Instrumentel Ltd. (a Unipart Technologies Group company) is leading a project to help the rail industry reduce asset maintenance costs and extend asset service life. Instrumentel has a proven track-record of building trusted partnerships by delivering solutions that enable the rail industry to save time, money and carbon through transforming data into usable, actionable insights. Instrumentel provides solutions and services to over 600 vehicles in the UK that collectively generate almost 4,000,000 data points every single day.

The project's innovation will focus on solutions to overcome the time and cost barriers associated with the installation of complex condition based maintenance (CBM) technologies. The project will demonstrate this solution in a live rail environment by working closely with an existing partner and train operating company.

Once the project has been successfully completed, Instrumentel plans to disseminate the innovative technology solution across the UK rail industry, to help reduce maintenance costs and extend asset service life.

Application Number	Project Title	Lead	Project Cost
10085411	Demonstration of Vault IoT for rail	COMPLETE CYBER LIMITED	£395,824

Public synopsis (text updated by the project team 04/10/2023 as requested by DfT)

Embark on a journey with Complete Cyber as we unveil the enhanced functionalities of Vault IoT, a pioneering handheld device meticulously engineered for rail companies to robustly safeguard their myriad of assets against cybersecurity threats. Positioned at the forefront of technology, Vault IoT seamlessly integrates asset detection, trend analysis, comprehensive reporting, vulnerability identification, and security detection, ensuring a fortified cybersecurity infrastructure across various passenger-facing assets, including but not limited to trains, stations, depots, control centers, and telecommunications infrastructure, whether stationed or in transit.

Public description (text updated by the project team 04/10/2023 as requested by DfT)

In the evolving digital landscape, cybersecurity has emerged as a paramount concern, particularly within the rail industry, where the utilization of operational technology-often devoid of original network connectivity designs-presents formidable challenges. A significant number of rail companies grapple with the absence of reliable asset lists and real-time status updates, rendering them vulnerable to cybersecurity threats.

Historically, solutions have hinged on the costly and infrequent involvement of outsourced contractors, typically once per annum, which impedes the consistent assessment and upkeep of cybersecurity. This sporadic approach inadvertently catalyzes unplanned delays, diminishing reliability, efficiency, and ultimately, customer satisfaction.

Complete Cyber is poised to transcend these challenges by further developing Vault IoT, a compact, rugged handheld device, innovatively designed for rail companies to diligently monitor cybersecurity across a myriad of environments. Vault IoT, with its remote connection, 4G connectivity, and cloud access, ensures not only swift and dependable asset detection and trend analysis but also delivers exhaustive reporting, vulnerability identification, and security detection.

Extensive on-site testing with Porterbrook, BCIMO, and Network Rail will guarantee that Vault IoT is not only user-friendly and intuitive but also meticulously tailored to meet consumer needs. Evaluative efforts, juxtaposing the tool against existing solutions, will scrutinize cost and time benefits, in addition to gathering invaluable user feedback.

Moreover, Complete Cyber is in the process of developing an array of complementary products within the Vault

range, aspiring to extend additional benefits to the Rail industry in minimizing Cyber risks and addressing reliability-related issues.

Vault IoT stands as a testament to multi-purpose applicability, extending its support and functionalities across trains, stations, depots, control centers, and telecoms infrastructure. Its robust design and high functionality in a compact form factor also make it applicable in broader industries such as water utilities, oil & gas, and maritime sectors, providing a holistic solution for asset discovery, cybersecurity risk mitigation, and version detection capabilities.

Application Number	Project Title	Lead	Project Cost
10089475	Automation of Tenanted Arches NDT Inspections using Robotics and Machine Learning	Manufacturing Technology Centre	£323,437

Public synopsis

The project aims to automate the inspection of cladded tenanted arches within the UK's railway infrastructure using advanced non-destructive testing solutions coupled with robotic deployment and artificial intelligence analysis. Through automation, the project aims to streamline the inspection of tenanted arches in order to improve their speed, accuracy and reliability.

Public description

This innovative project that aims to automate the inspection of cladded tenanted arches without the need to remove the cladding, and to also detect sub-surface defects in the arches, which is not currently possible with current methods. The project will focus on the use of robotics devices coupled with Non-Destructive Testing (NDT) techniques such as Ground Penetrating Radar (GPR) and X-ray Backscatter (XBS) to build an accurate and 3D picture of the overall health of the tenanted arches.

This proposal is a continuation of the successful activities between the MTC and Network Rail, the Tenanted Arches Project stream, in which GPR and XBS technologies were utilised to manually scan cladded tenanted arches within Greater London, quickly and without the need to remove or damage any cladding. In the latest stages of the project, it was possible to manually collect the required data and then quickly produce human readable information about the size and location of all relevant defects behind the cladding material. All the inspection thus far has been completed manually by operators, so this proposal will focus on fully automating the process such that it is faster and safer.

The proposed project involves four main activities: defining an automation platform for robotics devices to inspect tenanted arches without cladding removal, enhancing data processing techniques to improve image quality in the NDT scans, deploying machine learning algorithms for automated defect detection and visualisation in 3D space, and conducting a proof-of-concept demonstration to showcase the integration of systems and sensors. By automating inspections, enhancing data analysis, and leveraging advanced technologies, the project aims to streamline tenanted arch inspections, increase the quality and quantity of collected information, and improve predictive maintenance scheduling. Ultimately, the project will provide a safer, faster, and more reliable inspection solution for cladded tenanted arches in railway infrastructure.