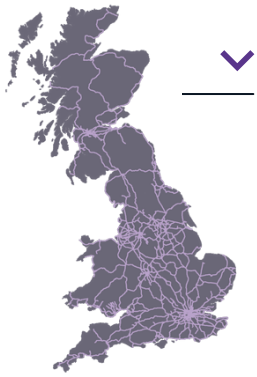


AiVR®

Network Rail - UK Case Study

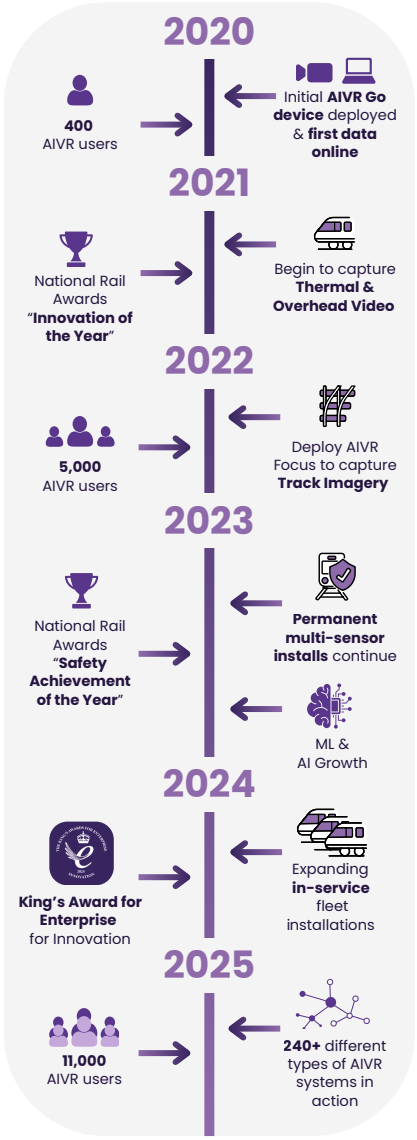
The Challenge



With over 20,000 miles of track to monitor and maintain, Network Rail (NR) have relied heavily upon scheduled inspections and manual site visits, whilst also timetabling their Measurement Fleet on an increasingly congested mixed-use railway network.

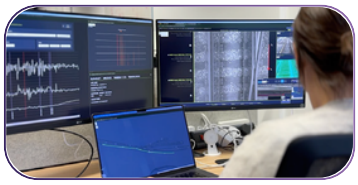
Alongside the growing demand for digitalisation, a confluence of factors created an urgent need for change: Track Worker Safety requirements, their Measurement Fleet approaching obsolescence, a changing workforce, operational pressures, and the unprecedented impact of Covid. Together, these drivers led NR to explore smarter, safer methods of infrastructure inspection.

The Solution



Early Introduction

In early 2020, One Big Circle introduced AIVR (Automated Intelligent Video Review) to Network Rail. A transformative inspection approach that automatically sent video imagery from in-service and measurement vehicles to the cloud, with secure online access for users so they could view up to date infrastructure imagery in rapid time. Whilst cameras on trains was not a new concept, the ability to view and interrogate that data had always been severely restricted, providing limited benefit to engineering teams.



Building the Right Services

OBC provided NR with a comprehensive range of AIVR data capture options –including Forward-Facing, Track, Thermal, Geometry and more. Delivered through both rapidly deployable devices and permanent installations on various train types, NR were able to build their optimal combination of data types and capture frequency to deliver them maximum operational benefit.

Scaling with Demand

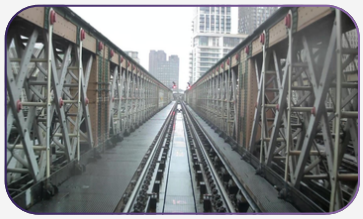
As data capture capabilities grew, NR confidently extended access to an increasing number of users across the organisation, assured that the AIVR system could support enterprise-scale deployment. From an initial handful of stakeholders, the user base has expanded to over 11,000 individuals spanning multiple disciplines. In response to user feedback, OBC built an increasing range of digital tools that enabled engineers to monitor, measure and plan remotely rather than being on site, reducing millions of hours of boots on ballast.

AI-Powered Intelligence

From 2022 onwards, as users gained confidence in both the source and quality of AIVR data, a series of Machine Learning advancements were delivered to automate asset and condition detection. By 2025, over 100 different assets and conditions could be automatically detected and reported. The reporting mechanisms were configured to meet discipline-specific requirements, ensuring users received the information they needed, when they needed it.

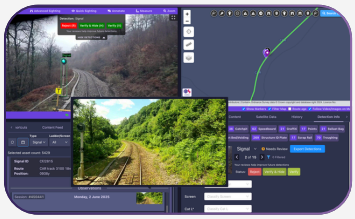
Example Applications used by Network Rail

Remote Inspection



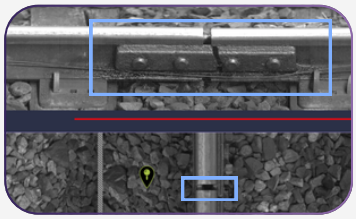
- Remote assessments have reduced track access requirements.
- Major safety advancements realised across the network.
- Users cover significantly more track in less time.

Asset Mapping & Condition



- Comprehensive asset database built without manual surveys.
- Located & identified trackside assets automatically.
- Asset conditions are being continually monitored.

Serious Track Defects



- Automated identification of critical safety issues.
- Early detection has prevented catastrophic failures.
- Significantly increased safety & provided cost efficiencies.

Benefits and Outputs

- **Continual Delivery: 5 years** of continuous contract between NR & OBC delivering service and innovation.
- **Full Network Coverage**: **240+** AIVR systems now deployed, delivering data to a unified online platform.
- **Seamless Integration**: Integrated with **multiple data suppliers and systems** for comprehensive monitoring.
- **100+ Machine Learning Models**: Deployed across multiple infrastructure disciplines for **assets** and **conditions.**
- **3 Million+ Hours**: **Boots on ballast removed** through remote inspection capabilities.
- **Dynamic Data Management**: Innovative capability to manage over **5PB** of data efficiently.

Types of Capture Systems Used

Portable Visible Camera



Portable Visible & Thermal Cameras



Track Scanning Cameras



Integrated Track Geometry



Key Feedback

Principal Engineer, Network Rail:

It's a fantastic project and the outputs greatly improve Network Rail's ability to **predict and prevent failures**, improving the service we provide to our customers.

Route Director, Network Rail:

[AIVR] solved two problems we had at once [...] it provided **up-to-date and scalable site footage** that enabled colleagues to **plan better** and negate the need to go lineside... The **safety value** of AIVR for both track workers and our assets continues to multiply.

Asset Engineer, Network Rail:

A process that could easily take days can be **completed in a fraction of the time**, allowing us to build up our renewals and minor works portfolio for the appropriate levels of funding as it becomes available.