Reliable and easy to maintain

RTS Innovating across Britain's railway

GOALS	WHY?	RECENT POSITION (2020)	STEPPING STONES IN THE NEXT FIVE YEARS	VISION FOR 2025	VISION FOR 2040
Improved reliability and availability of existing systems	Reliability that is appropriate to the role of rolling stock and fixed assets in the system reduces disruption to services and drives cost efficiency through less maintenance. Services should only be disrupted as a last resort when assets fail. Increasingly complex railway systems raise the likelihood of service disruption through faulty interactions of assets or sub-systems. Greater resilience needed to cope with system stresses including climate change.	The timing of failures is unpredictable resulting in over-cautious inspection and maintenance or emergency intervention and delay. Response to faults can overlook, or take insufficient account of, wider operational implications. Individually reliable components and systems can interact to delay trains.	Identify rolling stock and fixed assets to be prioritised for improved reliability and availability, based on their performance impact. For high-priority assets and their operations: identify and assess improvement options, and review fault response to ensure services can keep running with minimal disruptions. For high-priority assets, pilot and roll-out improvements to the assets, their management, fault response and operating approaches that keep services running. Agree principles and rules to report defects and repairs, allowing a system-level diagnosis of complex faults. Pilot cross-industry reporting system to prove its benefits in managing complex faults. Increase the range of assets covered by this reporting system and feed enhanced system-level requirements into design specifications.	System resilient to many localised failures. Improved reliability by designing refinements that have high performance impact. Improved availability by accommodating failures to in-service assets with 'smarter' operations. Knowledge is routinely applied to improve system reliability, with the workforce guided by data and maintainers engaged in design.	System resilient to most localised failures. All assets performing with a known and appropriate level of reliability at component, sub-system and system levels and causing minimum disruptions.
Safe and rapid inspection and repair	Targeted interventions based on the condition of rolling stock and fixed assets. Minimised downtime for maintenance and repairs can have significant positive impact on both costs and customer satisfaction. Lower risk to workforce and less disruption can be achieved by more automated inspection and repair methods, and decision support.	Progress towards optimal inspection and monitoring, but remote inspection and monitoring (RCM) and non-destructive testing is only used for a limited set of assets. Where deployed, RCM is starting to move workforce away from live operational environments. Most maintenance and repairs require rolling stock being temporarily removed from service or track possessions. Safety-driven initiatives to reduce workforce risk are focused on improving current procedures.	Identify which high-priority (cost and impact) rolling stock and fixed assets could best use RCM, aligned with available sensor and comms technology. Deploy RCM systems to high-priority assets and use the data to optimise inspection, servicing and replacement schedules based on asset conditions and performance. Develop and deploy RCM systems to more rolling stock and fixed assets. Evolve RCM algorithms to improve their prediction accuracy. Agree with industry and ORR the economic and safety case for condition-based inspection and maintenance. Identify assets suitable for robotic and Artificial Intelligence (AI) inspection and maintenance. Demonstrate robotic and AI inspections in live environments with remote supervision from the workforce. Prove initial robotic and AI repair concepts. Roll out of robotics and AI inspection. Demonstrate robotic and AI repair solutions in live environments.	Condition-based inspection and maintenance (optimised for practicability) is widely used, replacing periodic inspection and maintenance. Widespread use of robotics and AI to identify – and in some cases rectify – asset faults. Workforce has been trained on remote supervision, leading to fewer and shorter withdrawals from service or track possessions and greater safety.	All assets inform owners about health, degradation of performance and remaining service life. Railway maintenance is highly automated. Workforce typically co-ordinate automated repairs in live operational environments, often remotely.
Step-change in reliability, availability and whole-life cost for new assets	Future railway systems are designed to minimise single points of failure and deliver reliable service including under future climatic conditions. Upgrades of rolling stock and fixed assets are affordable and can deliver lower operating costs and a higher performing railway. Opportunity to create high-value, safe roles for our workforce, designed to exploit new asset capability.	The case for, and path to, next generation assets is not always clear and whole-life cost is considered too narrowly. New generation asset design is not always driven by reliability and availability, especially at a system level. Design thinking and enhancements to the current generation of assets provide insights to inform new specifications. Renewals and mid-life refurbishment present opportunities but are often used to replace like-for-similar.	Incorporate targets for Mean Time To Repair and Between Failures and ease of repair in asset specifications and sub-systems. Develop revised design specifications incorporating design for reliability and avoiding single point of failure. Use revised specifications when replacing assets. Workforce and technologists co-create opportunities and co-design new way to exploit new technology for safety, reliability and value. Pilot co-designed operating concepts and systems. Identify priority retrofit solutions to deliver a step-change through asset upgrades. Develop tools to plan and assess the case for transitions to step-change performance of assets. Apply the tools to inform industry planning.	Maintenance strategy and requirements are always specified at design stage as part of optimising whole-life cost. Key train and infrastructure requirements, or equivalents, set at an appropriate level of detail, system-level outputs and long-term asset strategy.	New assets designed for availability through non-disruptive repair; easy renewal; and reduced whole-life cost and environmental impact. New assets designed for reliability at system level and for future climatic conditions. They do not have single points of failure and include in-built health monitoring. Future transitioning and re-purposing of assets considered as part of design.