HS2 Accelerator 7.0

Challenge Specification Pack

HS2

Department for Transport

CATAPULT Connected Places

Automating Asset Management

How can we identify, monitor and manage the condition of rail assets?

For this challenge, we are seeking solutions with capabilities including, but not limited to, any of the following:

- Accurately monitor the condition of rail assets including tracks, signalling, overhead line equipment (OLE), points and crossings, structures, earthworks, telecoms, electrification & plant, drainage, cabling, and station assets – including assets in remote, underground, or inaccessible environments.
- Predictive modelling to analyse data from monitoring equipment and historical maintenance records to predict when an asset is likely to fail or require maintenance, allowing for proactive interventions.
- Identify common failure modes for different types of assets and suggest preventive measures to extend their lifespan using advanced analytics.
- Automated incident reporting that logs detected failures including time, location and environmental conditions for post-incident analysis and improving predictive models for maintenance.
- Correlate multiple data points from various systems to reduce false alarms and prioritise the most critical alerts, e.g. a combination of high temperature and abnormal vibrations might trigger an immediate inspection.

How can we ensure the integrity and accuracy of asset condition data throughout its lifecycle?

For this challenge, we are seeking solutions with capabilities including, but not limited to, any of the following:

- Standardised and automated asset data collection and reporting across different suppliers and contractors throughout the entire asset lifecycle.
- Prevent out-of-date (stale) asset data by using near real-time reporting of inspection and maintenance data.
- Identify inaccurate or anomalous data (i.e. 'false alarms') from monitoring equipment which may be caused by technical issues, environmental factors, and/or poor calibration.
- Integrate diverse asset data from different sources (maintenance teams, monitoring equipment, external suppliers/contractors, etc) to prevent data silos and provide a unified view of all assets and rail infrastructure.
- Prevent data loss and data corruption which compromises asset data integrity in the event of system failures or power outages.

Futureproofing Operations

How can we detect cybersecurity vulnerabilities and safeguard critical rail systems from cyber threats?

For this challenge, we are seeking solutions with capabilities including, but not limited to, any of the following:

- Utilise machine learning models to establish normal behavioural baselines for critical systems where deviations from these baselines trigger alerts, helping to detect sophisticated attacks that bypass traditional security measures.
- Monitor network traffic and system activities for suspicious behaviour, anomalies, or known attack signatures.
- Integrate automated tools that scan for vulnerabilities across all components of the rail network, including software, hardware, and network configurations.
- Implement security systems that continuously verify the integrity of data collected from sensors and other sources, detecting any potential tampering or corruption.
- Automated incident response protocols that can be triggered immediately upon detection of a cyber threat, e.g. isolating affected systems, blocking malicious IP addresses, and initiating forensic investigations.

How can we identify, monitor and prevent hazards, obstructions, unauthorised access, and trespassing in real-time?

For this challenge, we are seeking solutions with capabilities including, but not limited to, any of the following:

- Advanced monitoring and surveillance systems that can detect hazards, trespassers and obstructions in challenging environments e.g. low-light conditions and adverse weather (fog, heavy rain etc).
- Data integration to correlate information from diverse monitoring equipment, enhancing the accuracy of threat detection, e.g., combining video feed data with thermal imaging and vibration sensors to confirm trespassing.
- AI-driven object recognition that can identify and classify different types of rail obstructions, such as debris, vehicles, or animals, as well as distinguish between authorised and unauthorised personnel.
- Dynamic risk assessment that evaluates the severity of detected threats in real-time and recommends appropriate responses based on predefined criteria and real-time data.

Maximising Site Productivity

How can we automate on-site installation and fit-out (including civils, stations and rail systems) to improve productivity and reduce risk?

For this challenge, we are seeking solutions with capabilities including, but not limited to, any of the following;

- Maximising on-site productivity by harnessing alternative advanced automation technologies to complete installation and fit-out activities in environments unsafe for workers to operate, e.g. installation and fit-out activities that need to take place alongside dangerous or high-risk activities.
- Automating repetitive installation & fit-out activities across major contracts and sites with adaptability to various construction environments, including station fit-out, systems installations, tunnel fit-out etc.
- Significantly increase productivity by speeding up installation and fit-out processes and minimising downtime due to manual labour limitations.
- Seamless integration with management systems to ensure automated installation and fit-out adheres to design and engineering specification and standards.
- Remote monitoring and control capabilities allowing operators to oversee and manage tasks from a safe distance.

Contact

If you have any questions about any of these challenges, please contact Jasmine Pollock, Accelerator Programme Manager.