Systems Analysis

Background

Following a period of decline in railway utilisation in many regions across the globe, development, population growth, energy demands and environmental concerns have stimulated a renaissance in the railway as a central engine in the delivery of any economy. This has encouraged the need to run more services whilst achieving increased levels of reliability at reduced whole life cost. To meet these demands, the railway has had to evolve; becoming more precise, operating at tighter margins, whilst being more adaptable to meet changing customer needs. The requirement to run more services makes access to the equipment for repairs and maintenance increasingly difficult, further compounding traditional efforts to improve reliability. Therefore, a single, even minor incident affecting the equipment functionality can have immediate and significant engineering and commercial consequences for the railway.

The Challenge

Increasing budgetary constraints mean that governments and infrastructure owners are seeking cost effective solutions to meet the challenges of the demand for a 24/7 railway service through longer trains and/or increased train frequencies, increased system reliability and availability with reduced or no impact on train service performance.

How We Can Help

Systems Analysis provides the mechanism for developing appropriate evidence to inform key decisions An array of analysis methods can be deployed ranging from static analysis, dynamic simulation and increasingly through the deployment of formal optimisation methods.

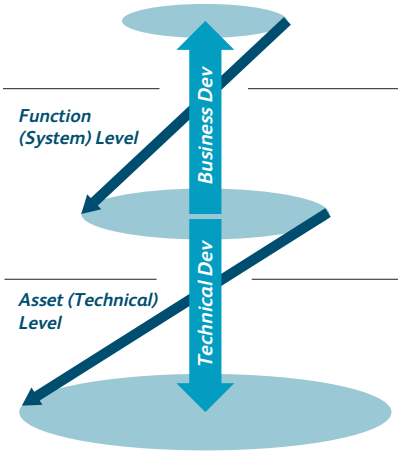
Systems Analysis encompasses the provision of formal analysis and simulation modelling techniques to inform key decisions relating to existing or future capabilities on the network:

- Journey Time Analysis & Capacity
- Layout & Signalling Performance
- System Workload / Duty Cycle / Tonnage Analysis
- Function Level Configuration and Functional Evaluation
- Formal Reliability Engineering
- Railway Performance and Whole Life Cost Analysis
- Formal Safety Assessment and Systems Integration
- In-service Analysis and Reliability Growth Planning
- DRACAS & Reliability Growth Management
- Quality Management Systems and Supplier Quality Assurance

We have a strong in-house systems analysis team with significant knowledge in the practical application of a variety of modelling tools to assess design or operational challenges from a range of perspectives.

Assessing the Railway as a System

Level	Output	Approaches
Railway (Business) Level	▸ Business Case ▸ PRAMS Demonstration ▸ Programme Trade-offs: capacity/reliability/ cost/infrastructure/trains ▸ Design/Operations/Maintenance	▸ Systems Integration ▸ Whole Life Simulation using RailSys/TRAIL ▸ Whole Life Cost Evaluation ▸ Programme Risk Analysis
Function (System) Level	▸ System Level Availability ▸ Trade-offs: Across functions, Within Functions ▸ Project Requirements ▸ Technical Readiness Requirements	▸ Functional Evaluation ▸ FMECA ▸ Use Case Scenarios ▸ RAM Apportionment ▸ Reliability Block Diagrams ▸ Availability and WLCs Baselining
Asset (Technical) Level	▸ Asset Class Reliability ▸ Critical Assets Index ▸ Project/Supplier Requirements ▸ Asset Level Whole Life Costs	▸ Benchmarking existing assets ▸ Development Programming ▸ Test Planning ▸ Supplier Quality Assurance ▸ Reliability Growth Planning ▸ DRACAS



Future Railway Study

The UK's national railway industry wide Technical Strategy Leadership Group (TSLG), commissioned Network Rail to undertake simulation analyses of a conceptual future double capacity railway to understand the relationship between reliability, capacity and cost. Using the southern section of the West Coast Main Line from London to the West Midlands as a conceptual railway we developed a high capacity timetable concept using RailSys and a railway system reliability concept using TRAIL. The models were used to assess the impact of prevention and mitigation improvement measures, and alternative headways on performance.

Crossrail Programme

We carried out a wide range of reliability and performance activities, including performance benchmarking, load prediction, Scheme Performance Assessment (SPA) and Capacity Utilisation Indexing (CUI) analysis, assessment of Manual / Automatic Train Operation, OSLO modelling for traction power, AC/DC change over reliability analysis, route level Failure Modes, Effects and Criticality Analysis (FMECA), development and application of TRAIL model and derivation, apportionment and specification of Reliability, Availability and Maintainability (RAM) requirements.

High Speed 2

Provision of strategic systems engineering guidance on programme through life management planning inclusive of early scheme analysis on optimal attainable speeds for new rolling stock on existing parts of the network, the provision of Conceptual Reliability Evaluation and provision of expert guidance on reliability.

ERTMS – Cambrian Lines

General RAM support to project including, performance benchmarking and identification of performance drivers, product level FMECA, RAM assessment, development and application of TRAIL model, headway analysis, SPA and CUI assessment.

Thameslink Programme

Performance benchmarking and apportionment, asset reliability assessment, station dwell time analysis, reliability requirements apportionment and specification, TRAIL model development and support SPA of different route sections.

Key SPA study assessing the performance of the resignalling works in the core, maintainability modelling and analysis.

Edinburgh Glasgow Improvement Programme

General systems analysis activities, including CUI assessment and development and application of TRAIL model.