Background

There is a perception that potentially overly prescriptive arrangements for route knowledge requirements mean that the rail industry is less good than it might be at:

- Recovering from perturbations on the network, eg failed train or infrastructure.
- Coping with reductions in network capacity, eg when a line or route is unavailable there is a tendency to rely on bus replacement services rather than using diversionary routes.

Using bus replacement services may be undesirable for a number of reasons: it leads to increased boarding and alighting risk as passengers are forced to change trains; increased crowding; increased risk from modal transfer as passengers are forced to other less safe forms of transport; and delays to passengers on their journey, resulting in reduced passenger satisfaction levels.

Specifically, this work is looking at the requirement for the use of 'route conductors' (RCs), otherwise known as conductor drivers. When a driver has insufficient route knowledge to drive a diversionary route, might it be possible for drivers without full route knowledge to drive a diversionary route with suitable additional controls, in place of the RC? This would aim to provide an alternative to the use of RCs; the principal issue being the difficulty of making sufficient numbers available in the context of an unplanned incident.

Aims

The aims of the project were to:

- Identify the hazards associated with driving with reduced route knowledge.
- Carry out driver trials, to investigate driver performance in specific situations.
- Investigate the feasibility of developing a risk assessment tool to assess the costs and benefits of using a diversionary route.

This was a limited feasibility study, not designed to resolve all the issues relating to route knowledge.
Findings

The main findings of the research were:

- Using diversionary route running, with reduced levels of driver route knowledge, has the potential to improve societal safety, network utilisation, and the reputation of the railway. Results also indicate that network utilisation benefits are much larger than safety impacts.

- Limited investigatory trials (16 drivers driving a combined total of 48 trial routes) found no evidence that drivers unfamiliar with the route could not safely drive diversionary routes, provided adequate safeguards were in place. The safeguards tested included lower speed running and provision of simple route information packs. In particular, unfamiliar drivers:
  - Did not exhibit a higher error rate than familiar drivers, despite being tested on difficult routes, under a range of visibility conditions, trackside degraded running, and train failures.
  - Drove slightly more cautiously than drivers with route knowledge when driving under ‘cautionary’ signals or where route features were more complex (eg diverging junctions), but the increase in overall journey time was small.
  - Had slightly higher workload ratings than drivers who signed the route. Higher workload may not necessarily be indicative of an undesirable level of workload, but may be indicative of higher physiological arousal and vigilance. That said, sustained high workload may have implications for the type and length of diversionary routes that may be considered suitable for implementation.

- Consultation with three TOCs indicated that each had potential diversionary routes that could be used in the event of disruption, to give improved operational performance. It was the view of the TOC representatives that, provided appropriate safeguards were put in place, safety performance would also be improved.

- Trial measurements and feedback from drivers indicated that both the Critical Route Information pack and travelling at reduced speed conferred benefit to the drivers when driving over routes with which they are not familiar.

- Risk assessment of diversionary routes is feasible, and could be used to help assess suitable routes.
• The permissible running speed for diversionary route running should be route specific and determined by the TOC following risk assessment of the route taking into account the lack of route knowledge by the driver, the risk increasing features of the route and the lowest and normal permissible speeds for the route.

• There is no common mechanism for proving RC competency within the industry. Within the sample of TOCs interviewed, there is no competency assessment for communication skills even though these have contributed to 74% of incidents where the RC is implicated in an incident.

**Deliverables**

The project deliverables included:

• A presentation for stakeholders on the approach taken to the study and the findings.

• A detailed report covering the findings and recommendations from the research; together with underpinning appendices explaining the root cause review, the hazard identification workshop, the Southern and National Express East Coast driver trials, and the development and trial of a risk assessment tool.

**Next Steps**

Operations Focus Group has noted that the human factors impact of any potential Rule Book change associated with diversionary route running would need to be considered carefully in order to provide suitable risk controls; and further evaluations would be needed to confirm the output of this study, testing a wider range of factors where route knowledge is considered a significant issue.

At this stage there are no proposals for further work in this area given that the expected benefits are unlikely to outweigh the costs.

**Contact**

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The project was completed in the phases presented in Figure 1.

<table>
<thead>
<tr>
<th>Method</th>
<th>Inputs</th>
<th>Key project activity</th>
<th>Outputs</th>
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<tbody>
<tr>
<td></td>
<td>Rule Book, RSSB operations experts consultation</td>
<td>Review of existing rules</td>
<td>Establish criteria for when RCs are required, Establish existing competency requirements</td>
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<tr>
<td></td>
<td>Prior SPAD research, Related formal investigations</td>
<td>Driver error in degraded mode – root cause review</td>
<td>Identify root causes of SPADs and other errors that may be affected by route knowledge or route conductor</td>
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<td></td>
<td>Train drivers, Train driver trainers, Operational experts</td>
<td>Workshop 1: Route and Route Conductor review</td>
<td>Identify features that make it difficult to drive a route without ‘knowledge’, Identify methods of risk mitigation, Identify important Route Conductor competencies, Assess increased error rate for unfamiliar drivers</td>
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<td></td>
<td>Trial plan</td>
<td>Simulator trail 1 (Southern)</td>
<td>Performance of drivers on complex unfamiliar routes, Effect of critical route information packs and driving at reduced speed, Feedback from drivers</td>
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<td>Trial plan</td>
<td>Simulator trail 2 (NXEC)</td>
<td>Driver performance on unfamiliar routes with reduced visibility, train failures, ESRs, wrong direction running, Feedback from drivers</td>
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<tr>
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<td>Southern trial route</td>
<td>Risk assessment of trial route</td>
<td>Evaluation of cases, Existing case, Case with diversionary route running, Assessment of risk and benefits</td>
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<td>Recommendations</td>
<td>Answers to each of the proposed questions identified in the remit</td>
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Figure 1 - The phases of the project