

A STRUCTURED INCIDENT ANALYSIS OF HUMAN PERFORMANCE IN FREIGHT TRAIN PREPARATION

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Background

- Critical importance of rail freight
- Safety (for people, for delivery)
- Condition of freight vehicles on the network
 - Importing risk onto the network
- Human performance is key to freight tasks
 - Lacking a structured analysis

Rail Accident Report



**Freight train derailment at Angerstein Junction
2 April 2014**

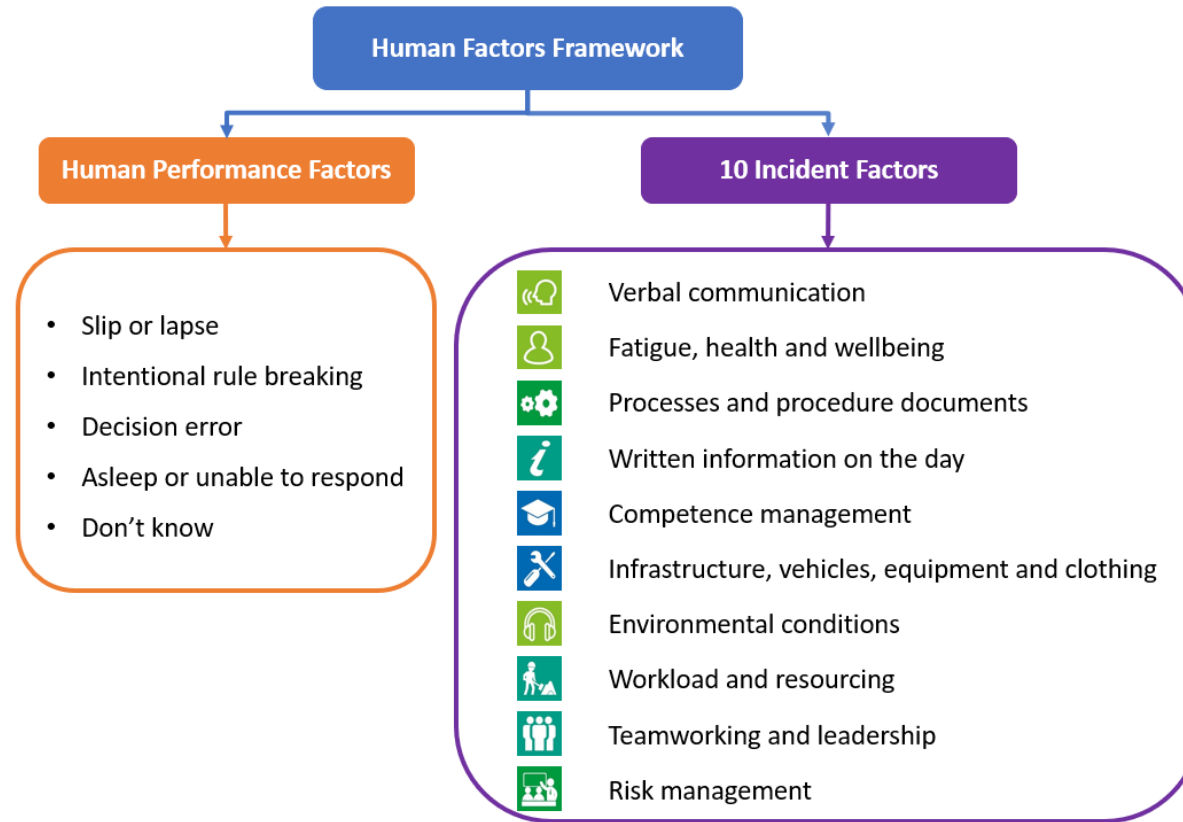
Aims and Objectives

Overall aim – understand how failures in human performance impact condition of freight vehicles on the network

Objectives

1. Identify adverse events (accidents and incidents), relevant to freight preparation, where human performance played a role
2. Identify and classify the types of human performance failures that led to adverse events
3. Identify and classify the factors underpinning human performance failures that subsequently lead to an adverse event
4. Use the analysis to identify future research and risk-reduction actions.

Analytical framework



Method

1. Set of candidate incident reports filtered for relevance
2. Sample (3) analysed by DG. Covered
 - i. Characteristics (see overview analysis)
 - ii. HF framework
3. Sample analysis discussed with JL and RSSB SME in HF Framework
4. Based on consensus, all reports were analysed by DG
5. Whole analysis shared with all authors for comment
6. Analysis report revised and confirmed with all authors

Overview analysis

Report types
<ul style="list-style-type: none">• 10 RAIB• 11 detailed• 16 brief

Freight type
<ul style="list-style-type: none">• 13 intermodal• 8 bulk /aggregate• 6 miscellaneous

Failure type
<ul style="list-style-type: none">• 14 wagon brakes• 3 loco brakes• 2 other brake• 7 other wagon issues• 1 SPAD

Point of identification
<ul style="list-style-type: none">• 4 before departure• 5 on arrival• 18 on the network

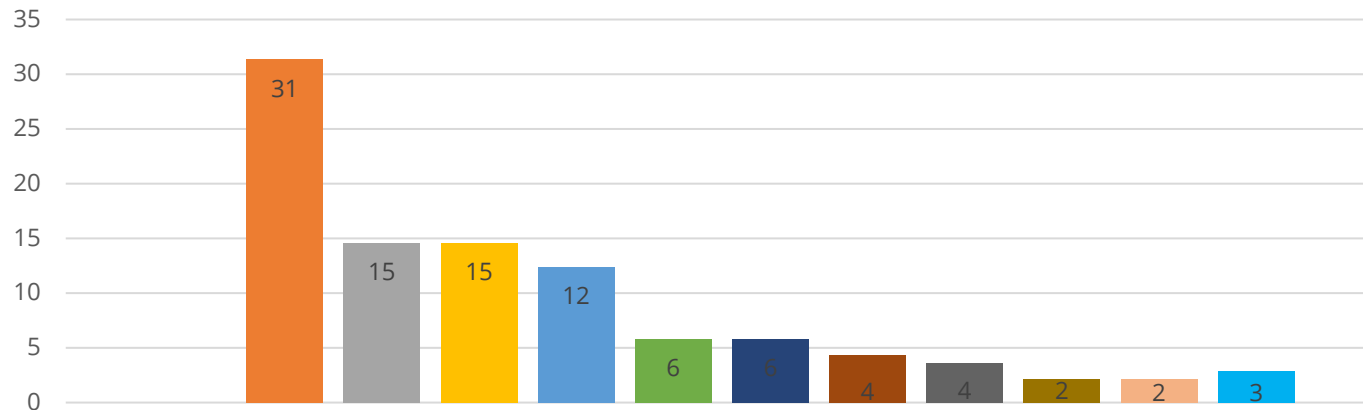
Outcome
<ul style="list-style-type: none">• 14 no or minor (wheelset) damage• 4 derailments• 3 collision• 3 wagon runaways• 2 SPADs• 1 wagon door issue

High-level pathway
<ul style="list-style-type: none">• 16 Human performance failure• 11 Mechanical failure but enabled / exacerbated by human performance failure

Detailed analysis – Human Performance Factor

Human performance factor	Sub-categories
Slip or lapse (16)	Forgot, misremembered or missed out (12) Misheard or mis-saw something (3) Said wrong thing or did wrong thing unintentionally (1)
Decision error (13)	Misunderstanding, wrong assumptions (10) Lack of knowledge (2) Don't know (1)
Don't know (10)	N/A
Biased by habits or previous experience (4)	N/A
Rush (3)	N/A
Distracted (1); Inexperience or unfamiliarity (1)	N/A

Detailed analysis – Incident Factor



- Infrastructure, vehicles, equipment, clothing
- Risk management
- Competence management
- Written information on the day
- Fatigue, health and wellbeing
- Unidentified
- Processes and procedure documents
- Workload and resourcing
- Teamworking and leadership
- Verbal communications
- Person's environment

Infrastructure, vehicles, equipment, clothing (43)

- Poorly designed (15)
- Unreliable (11)
- Poor maintenance (10)
- Not available (4)
- Don't know (2)

Process and procedures (20)

- No process or not comprehensive (14)
- Incorrect or incomplete (3)
- Process change issues (1)
- Difficult to understand (1)
- Don't know (1)

Risk management (20)

- Ineffective risk assessment (10)
- Management not fixing safety problem (5)
- Management not finding out about a safety problem (4)
- Don't know (1)

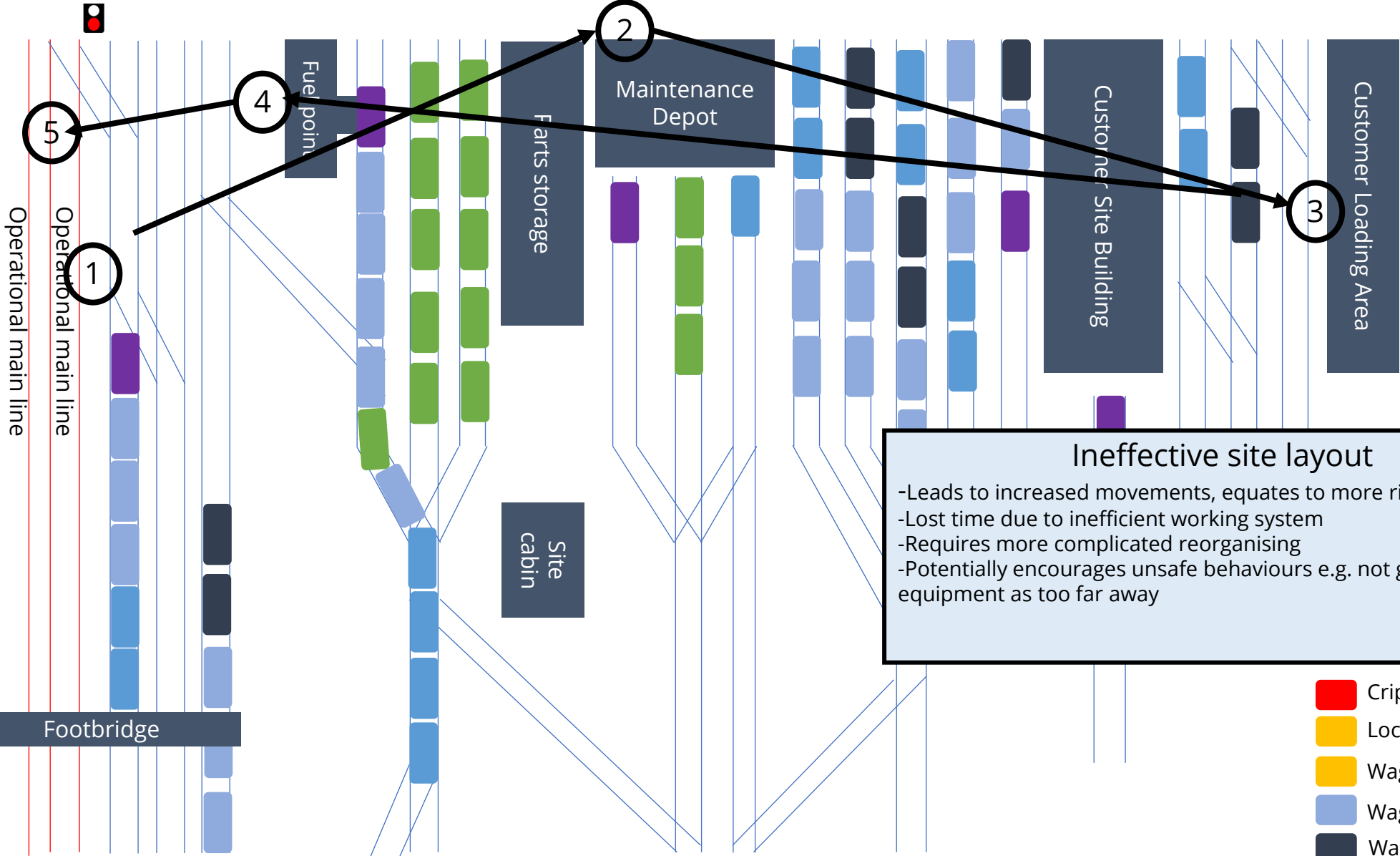
Discussion of analysis

- High number of slip / lapse or decision error
- Majority at train preparation phases – action or inspection
- Maintenance is a major factor
- Operational practice and complexity of operations is also a factor
- Workload is about resource, rather than cognitive workload
- Variable report and investigation quality
- Lack of analysis of upstream issues

Follow-on work, and outstanding questions

- Complete
 - Confirmation through interviews and surveys of freight staff
 - Confirmation through comparison with Six Sigma
- Ongoing
 - Observations of
 - Site complexity
 - Ground staff planning and workload
 - Maintenance

- Research questions
 - Report quality, and incident training
 - Frequency analysis
 - Improved data
 - What does good performance look like?
 - Understand the role of technology to alleviate issues



Ineffective site layout

- Leads to increased movements, equates to more risk
- Lost time due to inefficient working system
- Requires more complicated reorganising
- Potentially encourages unsafe behaviours e.g. not getting right equipment as too far away

- Crippled wagon
- Locomotive
- Wagon type A
- Wagon type B
- Wagon type C

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Thank you to National Freight Safety Group and RSSB for their support of the analysis

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