Selection of and proportionality in investigation

aka spending your time on the right things …
Learning from Events

Model Based on an extensive literature review: 13 steps and 5 stages

TNO – Dutch independent research organisation
Learning from Events – formal procedures

- 11 companies surveyed
- How do you formally organise your learning from events process?
Learning from Events – actual

- 11 companies surveyed
- How are the steps in the learning process actually performed?
Engineering work site given up whilst track remained obstructed

Issued to: All Network Rail line managers, safety professionals and RISQS registered contractors

Ref: NRB 17/09

Date of issue: 19/05/2017

Location: Kirkham South Junction, LNW Route

Contact: Darren Cobb, Head of Safety & Sustainable Development

Overview

At 05:25 on 15 May 2017 a tamper, travelling at 15 mph transiting to exit the possession safely stopped short of a 5 metre long pile which was obstructing the Down Main line.

The transit was not part of arrangements for verifying the line as clear. Other than the chance presence of the tamper, there were no further controls in place to prevent the first passenger service, at line speed encountering the pile.

So the work group installed the pile to a safe depth and travelled back to the access point approximately 20 minutes away. No-one on-site remembered to collect the pile which had been set down in the four foot.

An investigation is underway; however the following contributory factors have been established:
RSSB Investigation Guidance

Taking a risk based approach to investigations

Stage 1
Credible worst outcome

Stage 2
Effectiveness of barriers

Stage 3
Wider factors

Level of Investigation
Undesired Event

**Question 1**
What is the credible worst outcome?

**Note 1** Use the currently available information, e.g., from initial witness statements, early evidence, identifiable causes, human factors observations and risk assessments.

**Note 2** In answering the question start at the least outcome and follow the options below.

**Note 3** See on the next page the descriptions of the levels of consequence linked to the decision points 1-5 in green boxes below.

1. No injury or damage?
   - Yes
   - 2 Minor injuries and/or damage?
     - Yes
     - 3 Major injuries and/or moderate damage?
       - Yes
       - 4 Single fatality, multiple major injuries, major damage?
         - Yes
         - 5 Multiple fatalities, significant damage?
           - Yes
           - The potential consequence of the undesired event is:
             - Major

   - No
   - 2 Minor injuries and/or damage?
     - Yes
     - 3 Major injuries and/or moderate damage?
       - Yes
       - 4 Single fatality, multiple major injuries, major damage?
         - Yes
         - 5 Multiple fatalities, significant damage?
           - Yes
           - The potential consequence of the undesired event is:
             - Major

   - No
   - 2 Minor injuries and/or damage?
     - Yes
     - 3 Major injuries and/or moderate damage?
       - No
       - The potential consequence of the undesired event is:
         - Negligible

   - No
   - 2 Minor injuries and/or damage?
     - No
     - The potential consequence of the undesired event is:
       - Negligible

   - No
   - 2 Minor injuries and/or damage?
     - No
     - The potential consequence of the undesired event is:
       - Negligible

Stage 1
- Credible worst outcome

Stage 2
- Effectiveness of barriers

Stage 3
- Wider factors

Level of Investigation
Question 2
What is the overall level of effectiveness of the safety barriers preventing the undesired event reaching the credible worst outcome? (When considering the remaining barriers at this stage investigators should focus on those which are more immediate or local, rather than those at a higher management system level)

The level should not change to higher than that for the credible worst outcome. To use the matrix below first note the outcome from Stage 1 then answer Question 2 on the effectiveness of barriers. From the identified box then move down to get the initial level of investigation.

<table>
<thead>
<tr>
<th>Stage 2: Answer to Question 2</th>
<th>From Stage 1: The credible worst outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negligible</td>
<td>Low</td>
</tr>
<tr>
<td>Low</td>
<td>Medium</td>
</tr>
<tr>
<td>Medium</td>
<td>Major</td>
</tr>
<tr>
<td>High</td>
<td>High</td>
</tr>
</tbody>
</table>

The identified box is:

- Negligible risk
- Low risk
- Medium risk
- Major risk

Initial level of investigation:

- Record the event
- Low level
- Medium level
- High level

Stage 1: Credible worst outcome
Stage 2: Effectiveness of barriers
Stage 3: Wider factors
Level of Investigation
Question 3
Should the initial level of investigation be confirmed, escalated or downgraded after consideration of the following criteria?
• Any likely systematic management failures
• Existing company policies
• Potential loss via claims and insurance premiums
• The level of investigation for similar previous events
• Other related undesired events forming a series (e.g., common location, equipment, behaviours, personnel or underlying causes)
• Gaining the optimum safety benefit for the company and the industry
• Other investigations into the same event by, e.g., ORR, BPT and RAIB
• A sense check including consideration of public, passenger and stakeholder interests
• Issues relating to other involved Transport Operators

Confirm, escalate or downgrade the initial level of investigation and record the reason for the decision.

Final: Record the event  Final: Low level of investigation  Final: Medium level of investigation  Final: High level of investigation
The level of investigation should be kept open to review throughout the investigation process.

Stage 1  Stage 2  Stage 3  Level of Investigation
Credible worst outcome  Effectiveness of barriers  Wider factors
**PER decision grid**

(Guidance on completing the grid is presented in the notes section of the slides)

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1. **Is an investigation MANDATED\(^{(1)}\) by RAIR Regs 2005?**
   - Yes (MANDATORY investigation)
   - No

2. **Were the CONSEQUENCES, or POTENTIAL CONSEQUENCES, severe enough\(^{(2)}\) to justify further consideration?**
   - Yes
   - No

3. **Is there likely to be important SAFETY LEARNING?**
   - Yes
   - No

4. **Did accident result in a FATALITY or SERIOUS INJURY?**
   - Yes (FATALITY)
   - No

5. **Did accident result in a FATALITY or SERIOUS INJURY?**
   - Yes (FATALITY)
   - No (only LOCAL relevance)

6. **Is the event linked to a THEME of particular concern?**
   - Yes (THEME)
   - No

7. **Did the accident result in a FATALITY?**
   - Yes (FATALITY)
   - No

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**Selecting Investigations**

(August 2017)

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\(^{(1)}\) An investigation is mandated for a ‘serious accident’, namely an accident involving a derailment or collision of rolling stock which has an obvious impact on railway safety regulation or management of safety and includes such an accident that results in:
- a) the death of at least one person;
- b) serious injuries to five or more persons; or
- c) extensive damage (assessed to be greater than €2m) to rolling stock, the infrastructure or the environment.

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\(^{(2)}\) Accidents with the following consequences, or potential consequences are to be considered:
- a) moving train accident with fatality, serious injury, multiple minor injuries or significant damage;
- b) potentially high risk train accidents, ie derailment on a running line, collision causing significant damage, significant distance runaway, discharge from a dangerous goods train; or
- c) other high risk event, eg very serious SPAD, high risk WSF or catastrophic train failure.
## Accident consequences

<table>
<thead>
<tr>
<th>Schedule of accident</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sch no.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Is an investigation mandatory</th>
<th>Y/N</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Is it a moving train accident with</th>
<th>Y/N/-</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Fatality</td>
<td></td>
</tr>
<tr>
<td>• Serious or multiple minor injuries</td>
<td></td>
</tr>
<tr>
<td>• Significant damage</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>In slightly different circumstances could it have resulted in:</th>
<th>Y/N/-</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Fatality</td>
<td></td>
</tr>
<tr>
<td>• Serious or multiple minor injuries</td>
<td></td>
</tr>
<tr>
<td>• Significant damage</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Is it a ‘potentially high risk train accident’, ie:</th>
<th>Y/N/-</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Derailment on a running line</td>
<td></td>
</tr>
<tr>
<td>• Collision causing significant damage</td>
<td></td>
</tr>
<tr>
<td>• Runaway trains (significant distance)</td>
<td></td>
</tr>
<tr>
<td>• Discharge from a dangerous goods train</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Is it a high risk event, eg:</th>
<th>Y/N/-</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Very serious SPAD</td>
<td></td>
</tr>
<tr>
<td>• High risk WSF</td>
<td></td>
</tr>
<tr>
<td>• Catastrophic train failure</td>
<td></td>
</tr>
</tbody>
</table>
## Accident trends & initiatives

<table>
<thead>
<tr>
<th>Question</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is the accident/incident a part of a theme?</td>
<td>Y/N</td>
</tr>
<tr>
<td><em>If ‘NO’, there is no need to answer remaining questions on this slide</em></td>
<td></td>
</tr>
<tr>
<td>Are we currently monitoring the theme?</td>
<td>Y/N/-</td>
</tr>
<tr>
<td>Have the industry and/or safety authority got a related initiative?</td>
<td>Y/N/-</td>
</tr>
<tr>
<td>Should the theme be monitored as part of Schedule 3, etc. data capture?</td>
<td>Y/N/-</td>
</tr>
<tr>
<td>Is the associated trend significant enough (and/or rising) to warrant</td>
<td>Y/N/C/-</td>
</tr>
<tr>
<td>consideration for a class investigation?</td>
<td>C = Continue to monitor</td>
</tr>
</tbody>
</table>
## Safety learning

<table>
<thead>
<tr>
<th>Question</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is there the potential for important safety learning:</td>
<td>Y/N</td>
</tr>
<tr>
<td>• Remove a factor</td>
<td></td>
</tr>
<tr>
<td>• Prevent/reduce consequence of a factor</td>
<td></td>
</tr>
<tr>
<td><em>If ‘NO’, there is no need to answer remaining questions on this slide</em></td>
<td></td>
</tr>
<tr>
<td>Type of important safety learning:</td>
<td>N/R</td>
</tr>
<tr>
<td>• New recommendation</td>
<td></td>
</tr>
<tr>
<td>• Reinforcing previous recommendation</td>
<td></td>
</tr>
<tr>
<td>• Reinforcing compliance</td>
<td></td>
</tr>
<tr>
<td>Current understanding of important safety learning:</td>
<td>O/P</td>
</tr>
<tr>
<td>• Obvious</td>
<td></td>
</tr>
<tr>
<td>• Potential/requires further investigation to determine</td>
<td></td>
</tr>
<tr>
<td>Scope of important safety learning:</td>
<td>L/W</td>
</tr>
<tr>
<td>• Locally applicable</td>
<td></td>
</tr>
<tr>
<td>• Widely applicable</td>
<td></td>
</tr>
</tbody>
</table>
Near miss between a tamper and steel pile near Kirkham, Lancashire, 15 May 2017

1. Important safety messages

This incident demonstrates the importance of:

- having a formal, well briefed process for checking that a site of work is clear of materials and equipment at the end of work, including identification of the person with responsibility for the checking
- where possible, not placing objects capable of endangering trains in locations where such equipment could present a threat to railway safety were they to be forgotten
- good lighting at a site of work to illuminate any materials or equipment remaining on the track at the end of work
Risk Assessment Matrix (Safety) Method

Safety events from the National Control logs are assessed using the corporate risk assessment matrix (safety).

An initial risk rating determined using the following criteria:

- **potential impact** based on the worst credible outcome
- **likelihood** based on the number of times similar events with that potential impact have occurred previously (or are credible based on current trends)
### Risk Assessment Matrix (Safety)

<table>
<thead>
<tr>
<th>Potential Likelihood Score</th>
<th>A (&gt;25 years)</th>
<th>B (5 to 25 years)</th>
<th>C (1 to 5 years)</th>
<th>D (1 to 5 per year)</th>
<th>E (&gt;5 per year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>&gt;10 FWI</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2 to 10 FWI</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0.5 to 2 FWI</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0.1 to 0.5 FWI</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

- **potential impact** based on the worst credible outcome
- **likelihood** based on the number of times similar events with that potential impact have occurred previously (or are credible based on current trends)

Each cell contains the number of incidents with that risk ranking. For the risk ranking, the following criteria have been used:
- The potential impact score is based on the worst credible outcome of the event under different circumstances; and
- The potential likelihood score is based on the number of times similar events with that potential impact have occurred previously, or are credible based on current trends.

Likelihood and impact categories are based on the Corporate Risk Assessment Matrix (Safety).
Train Accident Risk HiPos – Period 5 - 7

The chart shows all Train Accident Risk events that have been ranked in accordance with the Corporate Risk Assessment Matrix and included on the Weekly Safety Summary since the start of Period 5 (up to Period 7, Week 3).

Those that are coloured Red are considered High Potential (HiPo) events and are included in this review.

The chart contains the following information:
- **Potential Likelihood Score**
  - A: >25 years
  - B: 5 to 25 years
  - C: 1 to 5 years
  - D: 1 to 5 per year
  - E: >5 per year

- **Potential Impact Score**
  - 5 >10 FWI
  - 4 2 to 10 FWI
  - 3 0.5 to 2 FWI
  - 2 0.1 to 0.5 FWI
  - 1 <0.1 FWI

Each cell contains the number of incidents with that risk ranking.

For the risk ranking, the following criteria have been applied:
- The potential impact score is based on the worst credible outcome of the event under different circumstances;
- The potential likelihood score is based on the number of times similar events with that potential impact have occurred previously, or are credible based on current trends.

Likelihood and impact categories are based on the Corporate Risk Assessment Matrix (Safety).
HiPo Events – Periods 5 to 7

The following table shows the Train Accident Risk events that have been identified as HiPo during Periods 5 - 7.

<table>
<thead>
<tr>
<th>Event Category</th>
<th>Code</th>
<th>Date</th>
<th>Location</th>
<th>Risk Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signalling WSFs</td>
<td>B4</td>
<td>15/08/2017</td>
<td>London Waterloo Wessex</td>
<td>A passenger train derailed by the two leading bogies and collided with an ALO (Adjacent Line Open) Barrier Train as it passed over pointwork as it departed London Waterloo (line speed 15 mph). Two minor injuries were reported.</td>
</tr>
<tr>
<td>Infrastructure Operations</td>
<td>C3</td>
<td>11/08/2017</td>
<td>RIDC Melton RIDC</td>
<td>Two Bombardier Crossrail trains under test came within a mile of each other on the same section of track on the Down Reversible Line between Asfordby and Old Dalby (line speed 125 mph), after an Operational Safety Manager gave permission for a train to pass a Stop Board and enter the section without establishing the position of the other train. RIDC (Rail Innovation &amp; Development Centre) Melton is operated by Serco under contract to Network Rail.</td>
</tr>
<tr>
<td>Objects on the Line</td>
<td>C3</td>
<td>25/08/2017</td>
<td>Giggleswick LNW</td>
<td>A passenger train struck a P’Way trolley loaded with sleepers on the Down Branch line between Giggleswick and Clapham whilst travelling at 60 mph. A line blockage of the Up and Down Branch lines had been granted earlier with the Down Branch Line Blockage handed back for the passage of the train, but with the P’Way trolley left in situ.</td>
</tr>
<tr>
<td>Train Operations &amp; Failures</td>
<td>C3</td>
<td>14/08/2017</td>
<td>Ely North Jcn Anglia</td>
<td>Eleven wagons of a freight train conveying 33 wagons derailed on the Down Main line at Ely west Jcn (line speed 60 mph). The last vehicle was also reported to be conveying dangerous goods, but did not derail.</td>
</tr>
<tr>
<td>Train Operations &amp; Failures</td>
<td>D2</td>
<td>15/08/2017</td>
<td>London Kings Cross LNE&amp;EM York</td>
<td>A passenger train struck the buffer stops in Platform 9 at London Kings Cross at slow speed, moving them back 1 metre. Two persons were reported to have sustained minor injuries.</td>
</tr>
<tr>
<td>SPADs</td>
<td>B4</td>
<td>30/09/2017</td>
<td>Princes Street Gardens Scotland</td>
<td>An unscheduled shunt movement passed E848 signal at danger at Princes Street Gardens by 46 metres, passing beyond the first potential conflict point and running through a set of points in the reverse direction (line speed 15 mph). A passenger train had been signalled through these points and the driver of the shunt movement (GB Railfreight) had read across to that signal.</td>
</tr>
</tbody>
</table>
## HiPo Events – Periods 5 to 7

The following table shows the level of investigation, lead investigator and RAIB level of investigation for the Train Accident Risk events identified as HiPo since during Period 5 - 7.

<table>
<thead>
<tr>
<th>Event Type</th>
<th>Date</th>
<th>Location</th>
<th>Level</th>
<th>Investigator</th>
<th>RAIB Investigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signalling WSFs</td>
<td>15/08/2017</td>
<td>London Waterloo</td>
<td>Level 3</td>
<td>TBC</td>
<td></td>
</tr>
<tr>
<td>Infrastructure Operations</td>
<td>11/08/2017</td>
<td>RIDC Melton</td>
<td>Contractor Level 1</td>
<td>Serco</td>
<td></td>
</tr>
<tr>
<td>Objects on the Line</td>
<td>25/08/2017</td>
<td>Giggleswick</td>
<td>Level 3</td>
<td>David Bray</td>
<td>Safety Digest</td>
</tr>
<tr>
<td>Train Operations &amp; Failures</td>
<td>14/08/2017</td>
<td>Ely North Jcn</td>
<td>Level 3</td>
<td>Ian Spencer</td>
<td>RAIB Investigation</td>
</tr>
<tr>
<td>Train Operations &amp; Failures</td>
<td>15/08/2017</td>
<td>London Kings Cross</td>
<td>TOC</td>
<td>GTR</td>
<td>Safety Digest</td>
</tr>
<tr>
<td>SPADs</td>
<td>30/09/2017</td>
<td>Princes Street Gardens</td>
<td>Level 3</td>
<td>Kenny Blythe</td>
<td></td>
</tr>
</tbody>
</table>