Industry collaboration

Presented by David Griffin
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What RSSB does...

“Through research, standards, analysis and insight, RSSB supports our members and stakeholders in driving improvements in health and wellbeing and delivering a safer, more efficient and sustainable rail system.”

Focus on those issues which one company can't solve on its own efficiently

Organisations have a legal duty to cooperate with one another on safety

Products and services:
- Tools and models
- Risk modelling
- Guidance, expertise, advice
- Training
- Good practice and tools
- Industry systems
- Standards
- Networking and industry groups
- Research
## What RSSB does not do....

<table>
<thead>
<tr>
<th>Enforce compliance against safety standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investigate accidents</td>
</tr>
<tr>
<td>Operate passenger or freight trains</td>
</tr>
<tr>
<td>Manage the track, infrastructure and stations</td>
</tr>
<tr>
<td>Determine overall transport strategy</td>
</tr>
<tr>
<td>Award franchises</td>
</tr>
</tbody>
</table>

*etc*
Introduction

Industry collaboration bowties

- **Collaboration**
  - Processes
  - Information
  - Tools
  - Focus

- **Collaboration bowties**
  - Understanding risk
  - Prioritisation
  - Monitoring

- **Generic hazards**
  - Standards
  - Reporting systems

- **The vision**
Safety risk management: legal duties

Single duty holder

- Ensure safety *so far as is reasonably practicable*
- Carry out *suitable and sufficient* risk assessments
- Have in place a Safety Management System
Safety risk management: co-operation

- ROGS regulation 22: duty of co-operation
Safety risk management: collaboration

- Working together to tackle:
  - Shared risks
  - Common interface issues
  - System-wide problems
Enablers of safety collaboration

Common processes

Common information

Common tools

Common focus
Enablers of safety collaboration

Common processes
Common information
Common tools
Common focus
Common processes

Taking Safe Decisions

• Principles applied by GB railway in making decisions that impact on safety

• Published following extensive programme of research and consultation

• Industry consensus endorsed by regulator
Common processes

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Common processes: Taking Safe Decisions

1.Commercial and other drivers
2. Define change
3. Identify hazards
4. Determine risk acceptance principles
5. Demonstrate compliance
6. Determine safety requirements
7. Identify hazards
8. Define change
9. Select options
10. Analyse options
11. Scope problem
12. Make change?
13. No
14. Yes
15. Monitor change
16. Monitoring
17. Monitor
18. Analyse
19. Review
20. Yes
21. No
22. Safety concern?
23. Making a change
24. Implement
25. Yes
26. No
Common processes

1 FWI = 1 fatality or 10 major injuries or 200 Class 1 minor injuries or 1,000 Class 2 minor injuries or 200 Class 1 shock/trauma events or 1,000 Class 2 shock/trauma events

VPF_{2017} = £1,897,000
Enablers of safety collaboration

Common processes

Common information

Common tools

Common focus
Common information

Safety Management Intelligence System (SMIS)
Common information

1988 - Clapham Junction
BR Incident Management System
Common information

1988 - Clapham Junction
BR Incident Management System

1994 - Privatisation

Safety Management Information System
Common information

1988 - Clapham Junction
BR Incident Management System

1994 - Privatisation
Safety Management Information System
1999 – Ladbroke Grove
2000 – Hatfield
Safety Risk Model
Agreement: open sharing of safety data
Common information

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BR Incident Management System

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Safety Risk Model
Agreement: open sharing of safety data
Precursor Indicator Model

Close Call System

Safety Management Intelligence System
Common information
Common information

1988 - Clapham Junction
BR Incident Management System

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Safety Risk Model
Agreement: open sharing of safety data
Precursor Indicator Model

Close Call System

Safety Management Intelligence System
Enablers of safety collaboration

Common processes
Common information
Common tools
Common focus
Common tools: Safety Risk Model (SRM)

- A structured representation of safety risk on the mainline railway
- Mature and well-used
- Basis for almost all safety-related QRA
- Disaggregates risk into >100 hazardous events and ~3,000 precursors
- Risk Profiling Tool allows localisation
Common tools: bowties

- Not widely used at cross-industry level (yet)
  - Freight derailments
  - Road risk
  - Trespass
- More widely used within individual companies
- Complements quantitative approach (SRM)
Enablers of safety collaboration

- Common processes
- Common information
- Common tools
- Common focus
Common focus: industry strategy

- Commitment from Industry leaders
- Priority initiatives to reduce health and safety risk
- A reference point for industry collaboration
Common focus: 12 priority areas

1. Workforce health and wellbeing
2. Public behaviour
3. Station operations
4. Road risk
5. Level crossings
6. Fatigue
7. Workforce safety
8. Infrastructure asset integrity
9. Workforce assaults and trauma
10. Train operations
11. Freight
12. Rolling stock asset integrity
Common focus: improving our capability

- Next generation reporting systems and risk models
- More effective assurance
- Design for health & safety and change management
- Exploit new technology
- Develop our people
- Smart supplier capability assessment & information
- Improved Health and safety cooperation
- Next generation rules and controls
- Improve learning, sharing and horizon scanning

Capability improvement
Common focus: Industry safety, health and wellbeing groups

- System Safety Risk Group
- Road Risk Group
- Heritage Trains Safety Group (TBC)
- Trespass Risk Group
- People on Trains and in Stations Risk Group
- Train Accident Risk Group
- Infrastructure Safety Leadership Group
- National Freight Safety Group
- Level Crossings Strategy Group
- Suicide Prevention Duty Holders Group

- Health & Wellbeing Policy Group
- Health & Wellbeing Professions Committee
- Health Economics Group
- Platform Train Interface Strategy Working Group
- TARG Editorial Board
- SPAD Risk Reduction Strategy Working Group
- Cross Industry Freight Derailment WG

- Risk Management Capability Group
- SMIS Advisory Group
- High Integrity Systems Group
- Risk and Safety Intelligence PAG
What do the risk groups do?

- Monitor industry safety performance
- Champion cross industry initiatives
- Highlight emerging safety issues
- Support RSSB’s engagement and communications
- Horizon scanning
- Share relevant learning and good practice
- Advise RSSB on its products, services and work programmes
- Identify safety priorities and share with industry

Advisory only - a platform for cross-industry collaboration and exchange of information
No safety management responsibilities - management of company safety obligations remains with DHs
The Taking Safe Decisions framework

- Safety concern?
  - Yes: Analyse options
  - No: Monitor change
- Monitor industry safety performance
- Identify safety priorities and share with industry
- Advise RSSB on its products, services and work programmes
- Highlight emerging safety issues
- Support RSSB’s engagement and communications
- Champion cross industry initiatives
- Horizon scanning
- Share relevant learning and good practice
Collaboration bowties
Collaboration bowties

- Inform a common cross-industry understanding of risk and how this risk is controlled
- Highlight weak risk controls and identify what improvements can be made
- Identify where additional monitoring could improve understanding of the effectiveness of risk controls
- Be overlaid with the various industry requirements and thus showing a clear link to industry standards
- Inform the future development of standards, guidance, tools and training.
What do collaboration bow ties look like?

- High level – specified level of interface between DHs
- Validated by cross-industry group
- Barriers scored for effectiveness
  - Publicly available (un-scored)
  - Available to members (scored)
- Chained where appropriate
- Threat lines linked to SRM (where possible)
Scoring the effectiveness of controls

Existing and potential future risk controls scored according to an effectiveness scale, such as:

<table>
<thead>
<tr>
<th>Effectiveness category</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>The control measure is a particularly effective control</td>
</tr>
<tr>
<td>Good</td>
<td>The control measure is an adequate control</td>
</tr>
<tr>
<td>Poor</td>
<td>The control measure is present but may need to be supplemented by other controls for effective control of risk</td>
</tr>
<tr>
<td>Potential</td>
<td>A control measure which could be applied, but is not present today</td>
</tr>
<tr>
<td>Unknown</td>
<td>Effectiveness of the control is unknown eg outside the competence of the workshop</td>
</tr>
</tbody>
</table>

Scores are “national” average
Using bowties to support monitoring

- Safety concern?
  - Yes: Monitor
  - No: Analyse

- Commercial and other drivers
  - No: Make change?
    - Yes: Review
    - No: Select options
  - Yes: Define change

- Determine safety requirements
- Identify hazards
- Determine risk acceptance principles
- Demonstrate compliance

- Implement

- Analyse options
- Scope problem

- Define change?
Using bowties to support monitoring

Effective monitoring allows the risk groups to understand:
- The overall level of risk and temporal trends in risk
- The effectiveness of individual or groups of controls
- The effectiveness of any risk improvements

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- The effectiveness of any risk improvements
Monitoring residual risk – Safety Performance Indicators (SPIs)

• Measurements that reflect the effectiveness of the risk control arrangements.

• Used to determine whether (or not) any trends are appearing in safety performance.

• Two key types of SPI:
  - **Activity**: A measure of whether a risk control system is in place
  - **Outcome**: A measure of events after they have occurred

<table>
<thead>
<tr>
<th>Activity</th>
<th>Results (outcome)</th>
<th>Precursors (outcome)</th>
<th>Accidents (outcome)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drugs and alcohol testing</td>
<td>Tests passed</td>
<td>SPADs</td>
<td>Train collisions</td>
</tr>
</tbody>
</table>
Activities required to deliver the risk control
Measure of whether the risk control is in place

Measures the results of the activity indicator
e.g. audit findings or inspection scores
Using bowties to prioritise improvements

1. **Scope problem**
2. **Identify hazards**
3. **Determine risk**
4. **Acceptance principles**
5. **Demonstrate compliance**
6. **Determine safety requirements**
7. **Identify hazards**
8. **Define change**
9. **Make change?**
   - Yes: **Select options**
   - No: **Monitor change**
10. **Commercial and other drivers**

- **Safety concern?**
  - Yes: **Monitor**
  - No: **Review**
- **Analyse**

**Implement**:
- **Scope problem**
- **Analisce options**
- **Select options**
- **Define change**
- **Demonstrate compliance**
- **Determine safety requirements**
- **Identify hazards**
- **Define change**
- **Make change?**
  - Yes: **Select options**
  - No: **Monitor change**

**Monitor**:
- **Safety concern?**
  - Yes: **Monitor**
  - No: **Review**

**Analyse**:
- **Safety concern?**
  - Yes: **Monitor**
  - No: **Review**

**Review**:
- **Safety concern?**
  - Yes: **Monitor**
  - No: **Review**

**Make change?**
- Yes: **Select options**
- No: **Monitor change**
Using bowties to prioritise improvements: Scoring process

- Identify controls where control effectiveness could be improved
- Identify prospects or initiatives that are required to realise this improvement
  - Improvement of existing control
  - Implementation of new control

<table>
<thead>
<tr>
<th>Criterion</th>
<th>L</th>
<th>M</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost pa</td>
<td>&lt;£100k</td>
<td>£100k-£1M</td>
<td>&gt;£1M</td>
</tr>
<tr>
<td>Complexity</td>
<td>Local, Single Duty Holder (SDH)</td>
<td>National SDH, or multi DHs in same country</td>
<td>Multi-modal, multi DHs internationally</td>
</tr>
<tr>
<td>Timescales</td>
<td>6 months</td>
<td>6m-2years</td>
<td>&gt;2 years</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Criterion</th>
<th>L</th>
<th>M</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ease of Implementation of change</td>
<td>Novel solution / change process</td>
<td>Adaptation of known solution &amp; change process</td>
<td>Known solution &amp; change process</td>
</tr>
<tr>
<td>Ease of monitoring effectiveness of change</td>
<td>New monitoring</td>
<td>Adapted monitoring</td>
<td>Existing monitoring</td>
</tr>
</tbody>
</table>
Using bowties to prioritise improvements: Safety benefits

- By how much would this project/initiative, in isolation, reduce this specific threat?
  - Either directly
  - As an enabler to further work

<table>
<thead>
<tr>
<th>Percentage reduction in risk per threat or improvement in understanding for key enablers</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>100-51%</td>
<td>Major improvement</td>
</tr>
<tr>
<td>50-21%</td>
<td>Significant improvement</td>
</tr>
<tr>
<td>20-10%</td>
<td>Medium improvement</td>
</tr>
<tr>
<td>10-5%</td>
<td>Small improvement</td>
</tr>
<tr>
<td>4-0%</td>
<td>Minimal to slight improvement</td>
</tr>
<tr>
<td>0</td>
<td>No safety benefit</td>
</tr>
</tbody>
</table>
Using bowties to prioritise improvements: Prioritisation

- Threat lines can be linked to SRM
  - Robust estimate of the significance of the threat line (FWI/yr)
- Controls may exist on more than one threat line
  - Need to be combine safety benefits
- Projects/initiatives can be plotted:
  - Safety benefit score vs
  - Effort score
Generic hazards and standards
Generic hazards

Intended to be an input to risk assessment / hazard identification process

- Encourages a consistent approach to hazard naming and levels
- Reduces effort in hazard identification
- Reduces the likelihood of missing hazards
- Published for rolling stock in GEGN8642 issue 1

Railway System (not complete!)
- Train
- Signalling
- Electrification
- Track
- Structure
- Station
- Level Crossing

Failure of train wheelset
Cyclic top
Structure collapse of overbridge
Train detection failure (wrong side)
Potential for slip, trip or fall

Generic hazards generally on the boundary of the railway “subsystems”
So how do generic hazards relate to collaboration bowties?

<table>
<thead>
<tr>
<th>Sub-system level 2 bowtie</th>
<th>Sub-system level 1 bowtie</th>
<th>Collaboration bowtie Railway system level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturing defect</td>
<td>Axle bearing failure</td>
<td>Loss of train guidance</td>
</tr>
<tr>
<td>Axle bearing defect</td>
<td>Wheelset failure</td>
<td>Derailment</td>
</tr>
</tbody>
</table>

**Generic hazards**

Generally more “causal” than collaboration bowties

- **Hot Axle Box Detection (Trackside)**
- GERT8014 Axlebox condition monitoring
Development of generic hazards

• Start with an initial set of hazards
  • e.g. the list in GEGN8642 issue 1
• As standards NTRs/RISs are updated, undertaking a mapping exercise
  • Mapping each requirement to one or more generic hazards based on which hazards the requirement is potentially a control for
  • If hazard doesn’t exist then create it
  • Publish mapping as appendix to NTR/RIS
• If the mapping is successful (and useful to the users) then complete for all standards
• As bowties are developed “causally” ensure that there is consistency between generic hazards and bowtie top events and threats
Development of generic hazards

CSM RA
Hazards can be close out by “codes of practice”

Goal
“to be able to select a hazard, and to query all the requirements than control that hazard from all standards”
The vision
Phase 1 – Industry Collaboration Groups

Railway System Level Bow Ties

How is risk controlled? What controls work well/badly?

Industry Collaboration Group

What has happened in the past? What does this really mean?

Safety Reporting

Past event data

Safety Monitoring Strategy

Control effectiveness

Projects and initiatives

How could controls be improved?

Projects and initiatives considered by Duty Holders

Duty Holders

Project Progress

Industry reporting systems

Duty Holder data entry
Phase 2 – Integration

Industry Collaboration

Safety Risk Model

Hazards aligned where possible

Data for risk estimates

Data informs effectiveness

Industry reporting systems

SRM risk + DH data = DH risk profile

Duty Holder data informs understanding of effectiveness

Bow Tie Server

Level 1 BowTie

Railway System Level BowTie

Aligned BowTie top event and threats

Industry safety reqmts mapped to hazards

Generic Hazards

Sharing Bow Ties Effectiveness scores

Potential Bow Tie Server / RMDB link?

Download and adapt

Industry Safety Requirements (RMDB)

Duty Holder audit & incident investigation

Duty Holder Bow Ties

Duty Holder data entry

Hazards aligned where possible

Data informs effectiveness

Risk Profiling Tool

Duty Holder data entry

Quantitative

Qualitative
Thank you