



Rail Safety & Standards Board



The use of risk assessment to inform safety decision making

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Rail Safety & Standards Board



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Who are RSSB?

- RSSB provides leadership on safety matters for the rail industry.
- Established in April 2003
- RSSB is a stand-alone body owned by the industry
- It has a members' council, a board and an advisory committee.
- International role (Europe and world-wide).
- 200 staff covering a range of technical and business disciplines



Our Role

- Long-term safety strategy for the industry
- Strategic Safety Plan
- Safety performance data, risk information, safety intelligence analysis
- Railway Group Standards
- Representation of the UK rail industry in the development of European legislation and standards
- Research and Development
- National Initiatives



Definitions

- **Hazardous event**
 - An event that could lead directly to injury, or fatality, during the operation and maintenance of the GB mainline railway
- **Fatalities and weighted injuries (FWI)**
 - 1 FWI =
 - 1 fatality
 - 10 major injuries
 - 200 minor injuries



Definitions

- **Collective risk**
 - Average number of fatalities and weighted injuries per year (for passengers, staff and members of the public) that would be expected to occur from a hazardous event, or group of hazardous events
- **Individual risk**
 - Probability of fatality per year to which an individual is exposed from the operation of the railway



Making safety decisions

- Railway companies are required to make safety decisions to reduce risk to a level that is as is *as low as is reasonably practicable*. That is their legal duty.
- What is reasonably practicable must reflect their social duty to deliver a railway that society demands and pays for through public subsidy and their commercial duty to shareholders and customers.



What is ALARP?

Benefits

- Safety benefits

Other Benefits

- Direct:
 - Cost of accidents avoided
 - Cost of inquiries avoided
 - Performance gains
- Indirect:
 - Avoiding loss of reputation



Costs

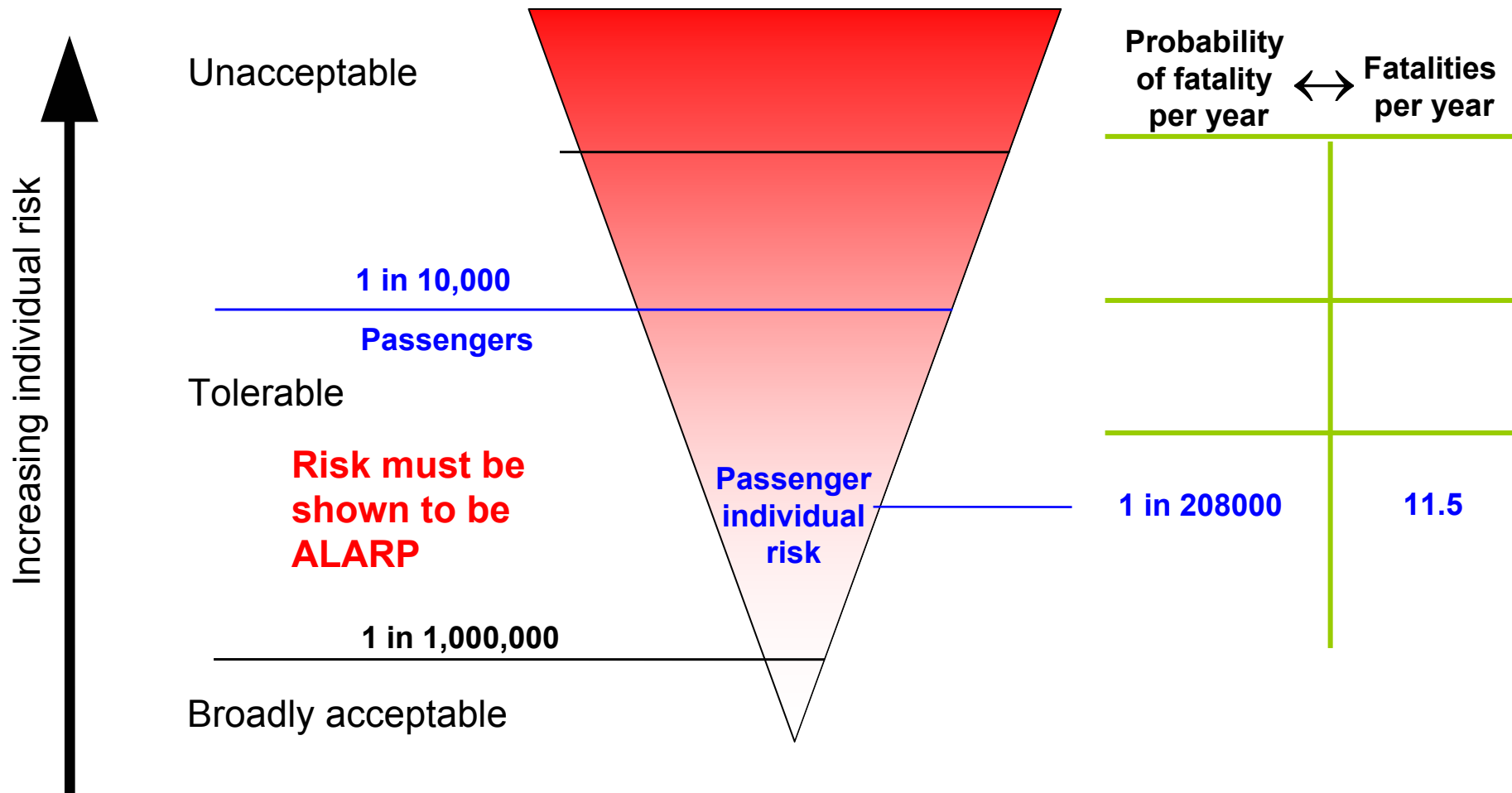
- Design
- Equipment
- Installation and testing
- Training
- Decreased safety in another area
- Operation and maintenance
- Loss of performance

Balancing the benefits and the costs

We must do all that is **reasonably practicable** to reduce risk

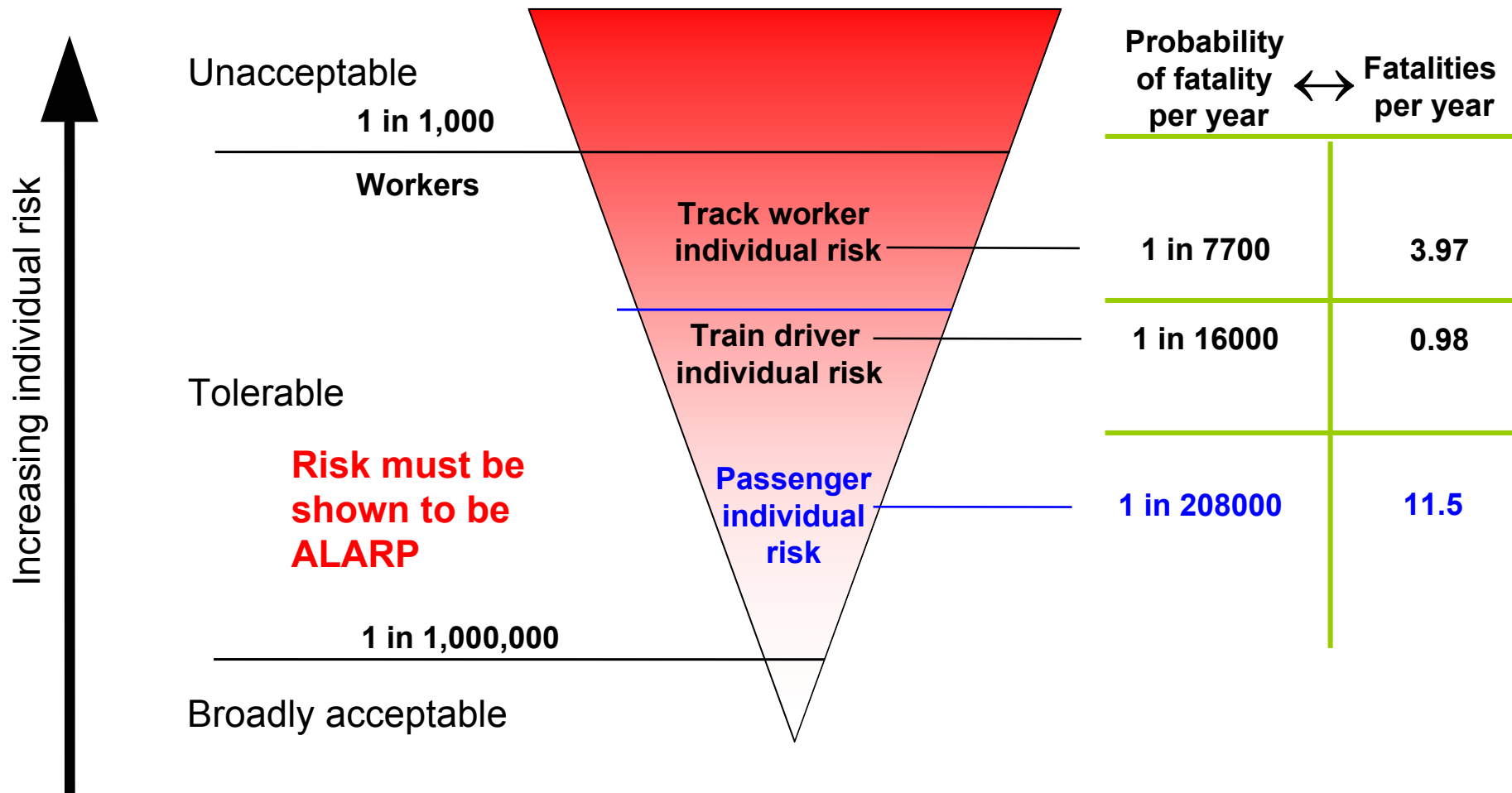


How are we doing?





How are we doing? - staff

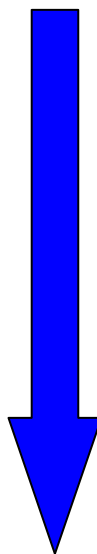




Making safety decisions

Development of a Safety Decisions Framework

*Routine
decisions*
**Increasing:
complexity,
novelty,
uncertainty,
scale**
*Complex
decisions*



- 1 Codes, standards, rules, procedures**
- 2 Established good practice**
- 3 Professional judgement and qualitative analysis**
- 4 Quantitative risk assessment/CBA**
- 5 Corporate and social values**

Safety Decisions Framework

Management decisions

Immediate decisions

Strategic analysis

Targeted engagement

Quantitative analysis

Established good practice

Professional judgement

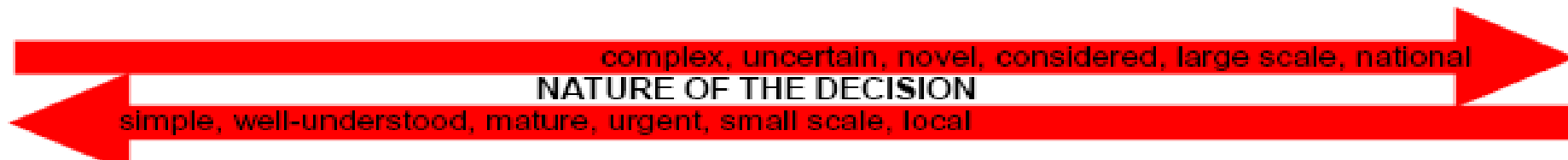
Rules and standards

Qualitative analysis

complex, uncertain, novel, considered, large scale, national

NATURE OF THE DECISION

simple, well-understood, mature, urgent, small scale, local





Risk Assessment

- Railway industry is committed to a risk based approach to safety decision making via:
 - Review and recognition of good practice
 - Overall systemwide Safety Risk Model
 - Safety Case risk assessments
 - Impact assessments for changes to Railway Group Standards
 - Project safety case risk assessments
 - Ad hoc risk assessments



Risk assessment

- Qualitative:
 - Largely professional judgement
 - The essence of the application of the ALARP principle to a duty holder's operation is not necessarily about a detailed quantified ALARP demonstration but a demonstration that gives confidence that risk reduction is being considered in a comprehensive, structured and auditable way.



Risk assessment

- Quantitative:
 - Large resource commitment
 - In many cases poor data
 - Need for risk assessment and CBA skills



Overview of the SRM

To manage safety effectively, it is vital that we are able to assess and understand the safety risk associated with our railway

The Safety Risk Model (SRM) is the core source of risk information for the rail industry

It is a structured representation of the 125 hazardous events that could lead directly to injury, or fatality, during the operation and maintenance of the GB mainline railway



Overview of the SRM

The SRM provides a prediction of the underlying level of residual risk on our railway taking account of the risk contribution from:

- **High frequency** but **low consequence** events
- **low frequency** but potentially **high consequence** accidents for which there is little or no relevant data available

Where possible, the model is populated using relevant historical accident data

Where little data exist, the model makes use of structured expert judgement and statistical methods



Overview of the SRM

In this way the SRM provides an estimation of the underlying levels of risk on the railway that is not obtainable from historical data alone

Version 5 of the model has just been completed (July 2006)



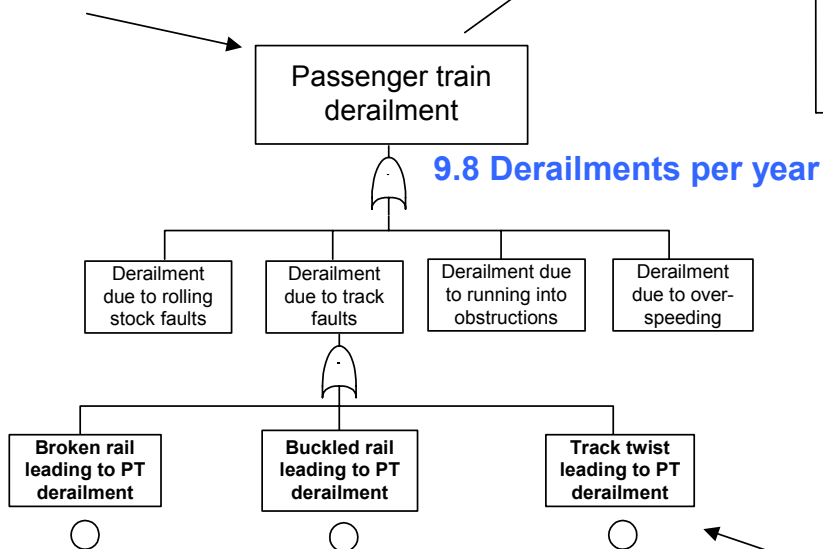
Model example

Escalation factors

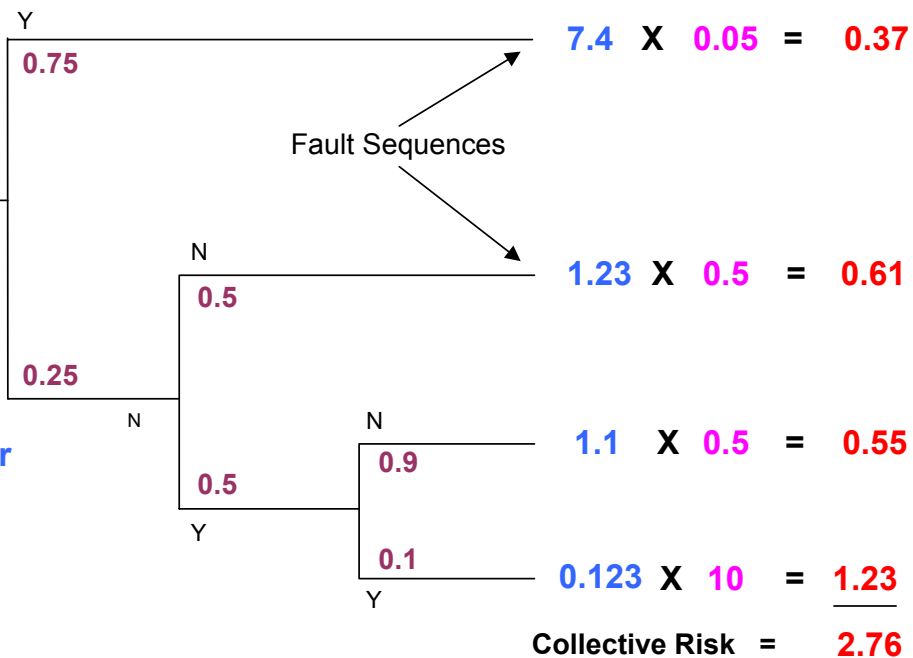
Frequency of derailment (Events/ year)	Does train maintain clearances? Y/N	Does train obstruct an adjacent line? N/Y	Is there a collision with train on the adjacent line? N/Y	Fault Sequence Frequency (Events/yr)	Consequences (Eq fatalities/ Event)	Risk (Equivalent fatalities/yr)
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FAULT TREE (not fully developed)

Hazardous event definition



Precursors (Cause)

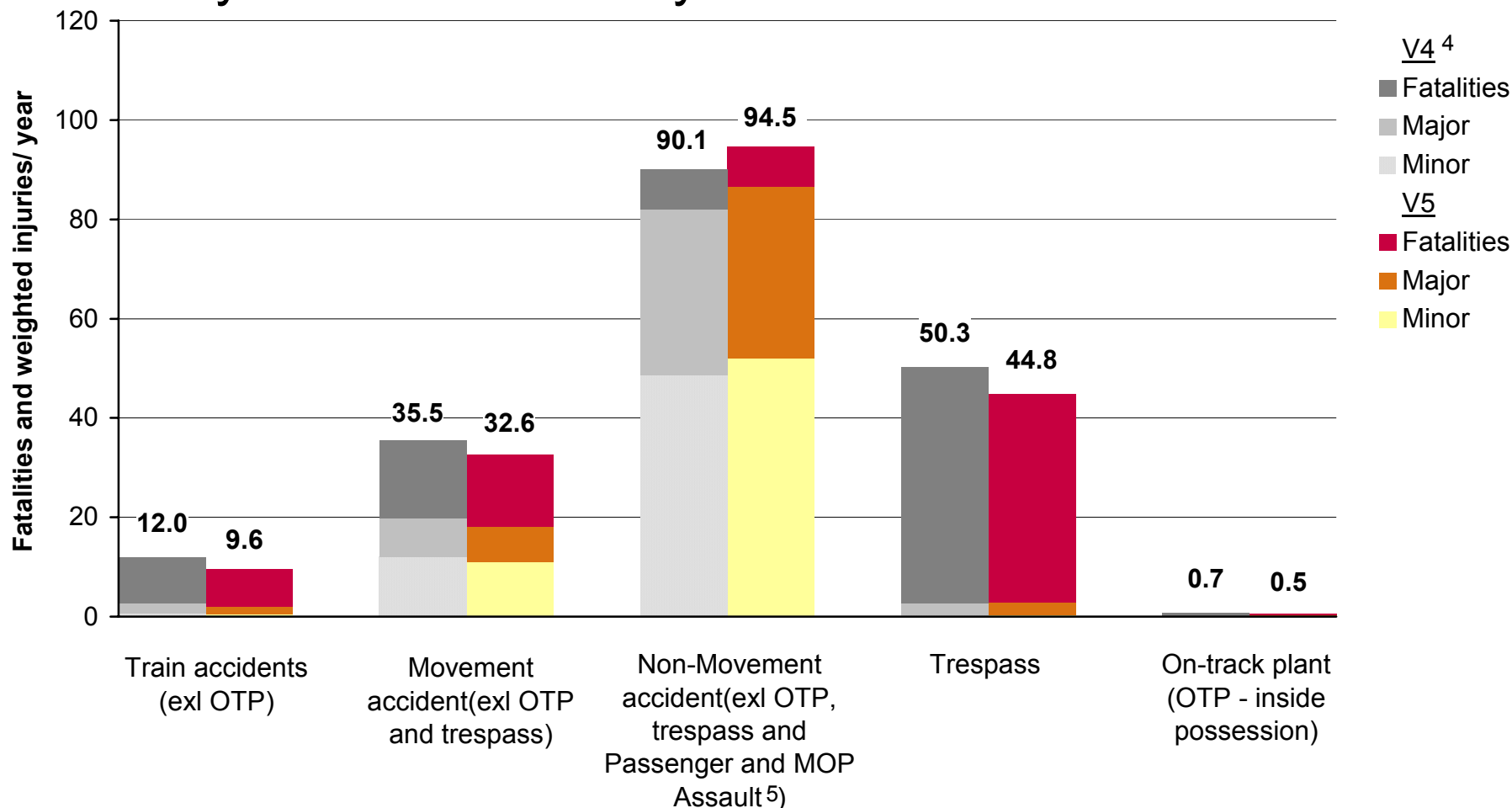


EVENT TREE (not fully developed)



SRM – v4 to v5

The overall risk, from v4 to v5, has reduced from 188.6 FWI/year to 182.0 FWI/ year.





Current views

- Need for consistent safety decision making across our industry and in government
- Rail and road safety project appraisal should share a common willingness-to-pay based VPF for the typical rail passenger or road user (£1.5m per fatality prevented) that includes:
 - Loss of output due to injury
 - Ambulance costs
 - Costs of hospital treatment
 - Human costs – pain, grief, suffering, etc for casualty, relatives and friends



Current views

- There is no justification for a test of ‘gross disproportion’. What *is* required is *proportionality*.
- Need for consideration of societal concern in decision making?
 - do we know what this means?
 - what is the legal duty?



Summary

- The railway industry takes a proactive role in managing safety risk to a level that is ALARP
- There is a need for consistent safety decision making across our industry and in government
- The cost of safety enhancements should be proportionate to the benefits not 'grossly disproportionate'
- We employ a variety of risk assessment tools to help us with safety decision making. The SRM is a key industry resource.
- A consistent and proportionate decision making framework based on sound risk assessment will enable us to be confident in the decisions that we take