THE AUSTRALIAN RAIL RISK MODEL (ARRM) PROJECT

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SUMMARY

Australia's National Rail Safety Law dictates that rail companies take a risk based approach to managing safety. There are however, currently a wide variety of approaches, practices and maturities. RISSB is seeking to follow the example of other Railways and other industries, both domestic and international, to develop a national information system that will provide a more robust, consistent level of risk information. This will make the Australian railway smarter, it will improve the efficiency of regulation and will ultimately contribute to the delivery of better safety outcomes.

INTRODUCTION

The Rail Industry Safety and Standards Board (RISSB) is responsible for the development and management of Australian rail industry standards, rules, codes of practice and guidelines. Up until this year (2015) RISSB was wholly owned by the ARA but now a new constitution and ownership arrangements have been introduced making RISSB wholly owned by its funding members.

The Australian Rail Industry has achieved great gains in productivity and safety. In spite of this RISSB has, for many years, championed the idea that a step change in safety risk management maturity can be catalysed with the development of a national railway risk model. These sentiments have been echoed as follows:

- In 2008 the National Transport Commission published its National Strategy for Rail Safety Data recommending that the rail industry consider developing a rail safety database and a safety risk model.
- In 2012 the Governments of Australia commissioned Tony Taig's to review RISSB. Taig recommended that "The Australian rail Industry needs to act collectively and urgently to improve its cross-industry safety risk knowledge … This will require a) establishment of a shared national database of industry safety incidents and occurrences, b) development of risk assessment tools and capability building on that database …".
- In 2013 the Office of the National Rail Safety Regulator commenced operations and in its Statement of Intent (2013 to 2016 and then again from 2014 to 2017) it was "encouraging industry to develop an industry owned national rail safety risk model".

The project is seeking a mandate in a difficult co-regulatory environment, one with a wide range of risk management maturities. There are organisations with very sophisticated approaches to risk management, and others that are some way behind. The challenge will be to build a risk model that benefits individual rail organisations, as well as the Industry generally.

WHAT IS A RISK MODEL?

A risk model is a device which simulates real world scenarios, and generates information to enable rail companies, regulators, investigators, Governments and standards setters to make informed risk-based decisions. It considers the likelihood of certain scenarios eventuating, and the range of possible

consequences should they arise. In this case the scenarios relate to hazardous events on the railway with the potential to harm people.

Having this 'predictive' capability enables the railway to focus its efforts in those areas of greatest risk thereby proactively managing safety, and preventing accidents before they occur. As safety improvements are implemented, their safety dividend will be reflected in the outputs of the model thus the model has a secondary purpose of measuring safety improvement over time.

WHY DOES AUSTRALASIA WANT A RISK MODEL?

Governments invest in major projects that reduce risk, RISSB develops products that target risk, individual rail operators and network manager's design and implement safety management systems to eliminate or control risk, and the rail safety regulator prioritises its efforts with a consideration of risk.

The need to identify, control, and manage risk is collective and deserves a consistent and harmonised approach across the Rail Industry to provide an effective and robust result whilst reducing the costs associated with the current sometimes disaggregated, and in some cases, inefficient approaches.

The risk model will:

- Support risk-based decision making, adding to the defensibility of decisions;
- Ensure the regulator and industry share the same safety priorities;
- Enable the regulator to focus on areas of concern and less on low (or well controlled) risk areas;
- Support a smarter standards regime (helps to prioritise RISSB standards production and drive content).

The benefits will be:

- Reduced costs;
    - At an organisational level there will be the potential for cost savings through the streamlining of multiple reporting lines. ARRM will be a system for industry itself but it also aims to be the sole system from which the regulator and ATSB will draw occurrence data information.
    - At an industry level there will be cost savings from collocating data. At the company level it is possible that some companies may be able to migrate over to significantly rely on ARRM and perhaps some may even 'switch off' their own databases.
- Improved decision making (and hence safety) through:
    - anonymous benchmarking against industry peers (subject to careful consideration and determination by industry stakeholders);
    - a greater pool of information and therefore more robust analyses, especially important to low frequency (high consequence) events.

ARRM STRATEGY

The Australasian Rail Risk Model (ARRM) project is underpinned by the following strategic principles.

ARRM will be:

- developed by the industry for the industry,
- developed collaboratively between all parties,
- designed and built to capture and analyse national risks,
- affordable and accessible and scalable for future change,
- supported by a national rail safety incident database, and the appropriate IT Support,
- designed to minimise duplication of data input and reporting,
- designed for data to be shared but with appropriate security restrictions,
- based on actual incident data,

- used in the spirit of co-regulation,
- adopted nationally by all stakeholders, including the office of the National Rail Safety Regulator,
- developed cognisant of international and national experiences,
- designed after all parties agree on methodology, metrics, criteria etc, and
- provided ongoing technological support and analysis.

ARRM Strategic Outcomes

The ARRM will:

- enable the Regulator and Industry to be on the same page regarding safety risk and priority setting,
- allow organisations to access and tailor risk data according to their requirements,
- allow safety risk predictive analysis to occur,
- add value through benchmarking, standards setting,
- provide risk data to support government investment decisions and economic growth of the Industry, and
- provide risk reports that are tailorable to individual organisations requirements.

LEARNING FROM ELSEWHERE

RISSB will draw on the corporate knowledge of member organisations and lessons learned over many years of them developing their own knowledge bases.

Likewise RISSB will look internationally to learn from countries such as the UK where rail organisations utilise the Safety Risk Model (SRM) provided by RSSB. The SRM is a quantitative representation of the potential accidents resulting from the operation and maintenance of the GB rail network. At its core are over 100 fault and event tree models for various hazardous events.

The SRM is, where possible, populated using data from the UK rail industry's safety incident data taken from the safety management information system (SMIS). The SRM also includes predictions of the risk contribution from low frequency but potentially high consequence incidents for which there is little or no relevant data available. Where little data exists the model makes significant use of structured expert judgement from technical specialists to populate the model.

In the UK, the SRM has helped to focus efforts in the right places and has subsequently measured the improvements they have made. The following diagram shows how the SRM (or the Precursor Indicator Model[1] to be precise) quantifies the major contributors to train accident risk. You can see that at the end of the millennium 'SPADs', 'public behaviour at level crossings' and 'infrastructure failures' were the key contributors to train accident risk. This enabled the UK railway to deliberately focus safety interventions in those areas and you can see the significant improvement made up to 2012. Note specifically the great reduction in SPAD risk, while public behaviour at level crossings remains stubborn.

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[1] The Precursor Indicator Model measures the underlying risk from train accidents by tracking changes in accident precursors. The PIM is calibrated against the Safety Risk Model.
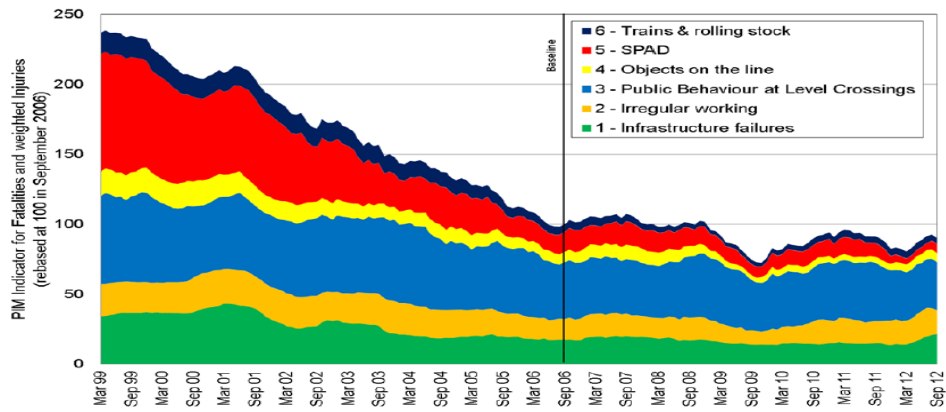
The SRM is very strong in its analysis at a national level and provides vital information to the strategy and standards-setting arms of RSSB UK, as well as providing key metrics to the UK government. The risk information provided by the SRM helps UK rail companies understand their own risk profile and benchmark their performance. This in turn helps them formulate their own safety policies, plans and measures.

The ARRM will benefit from the lessons learned in developing other risk models like the SRM. Through RISSB's relationship with RSSB UK, it will draw on the corporate knowledge of RSSB UK over more than a decade of its development.

NEXT STEPS

At present there is work being undertaken in the development of a prototype risk model which focusses on derailments for a small part of the Australian network. That prototype will form part of a promotional package of materials used to raise industry support for the project over the next 6 months or so. The main body of work is expected to begin in earnest mid-2016 with the expansion of the derailments work into other hazardous contexts - expected to take several years.

CONCLUSION

This project is expected to bring significant safety benefits to the Australian railway, and make it a more intelligent industry. The work will involve bringing the industry together to agree data definitions and reporting lines (likely to take advantage of legislated incident reporting requirements). These will require negotiation and compromise between industry players. As such this project is seen as a stakeholder engagement project more than an information technology project. Its impacts on how industry collects safety data (and which pieces of data), how it informs safety decision making and railway regulation/investigations mean this new information system represents a whole-industry change program.