Prioritising Safety Investment through Comparative Risk Assessment

International Railway Safety Conference

Perth, 2004

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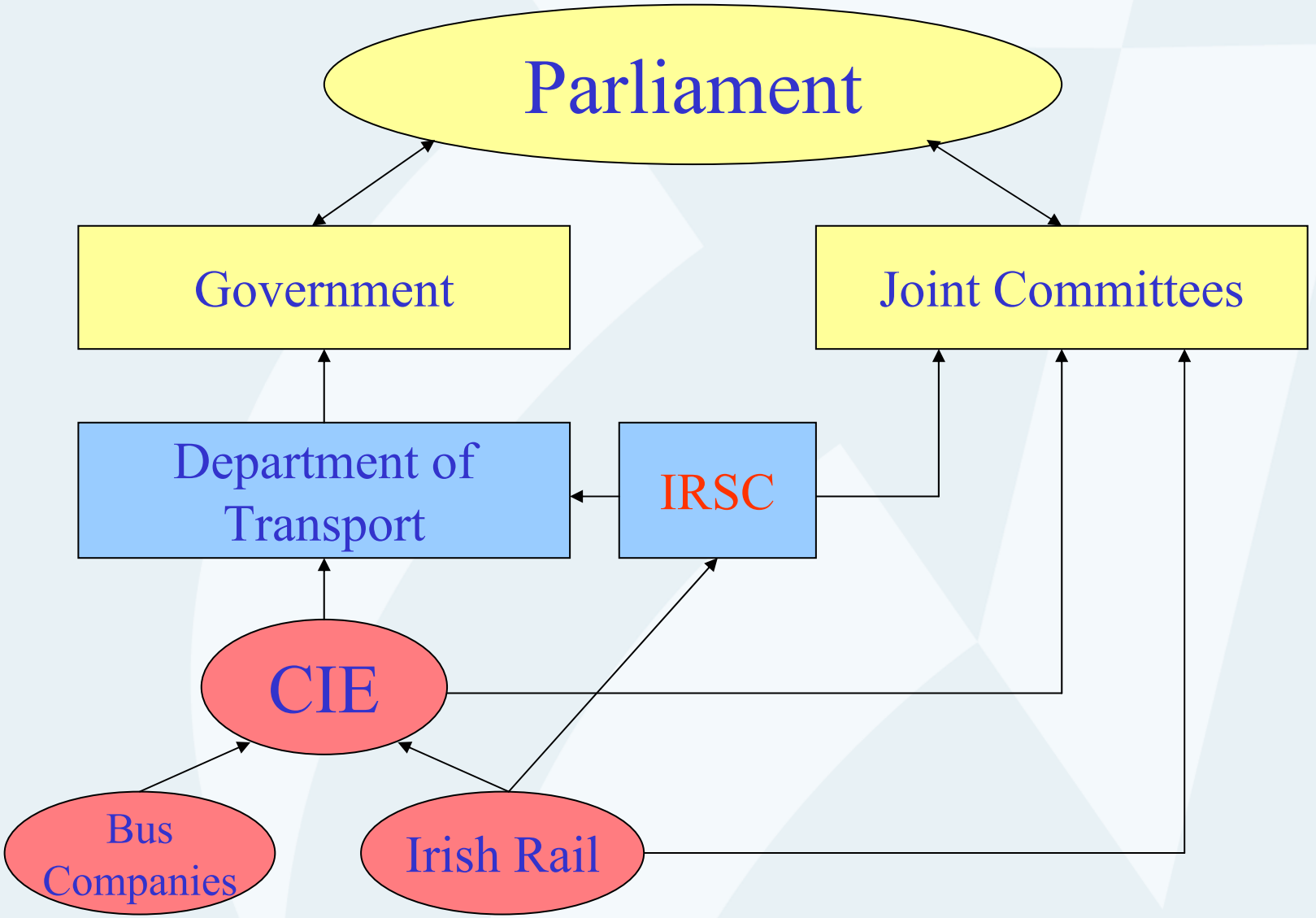

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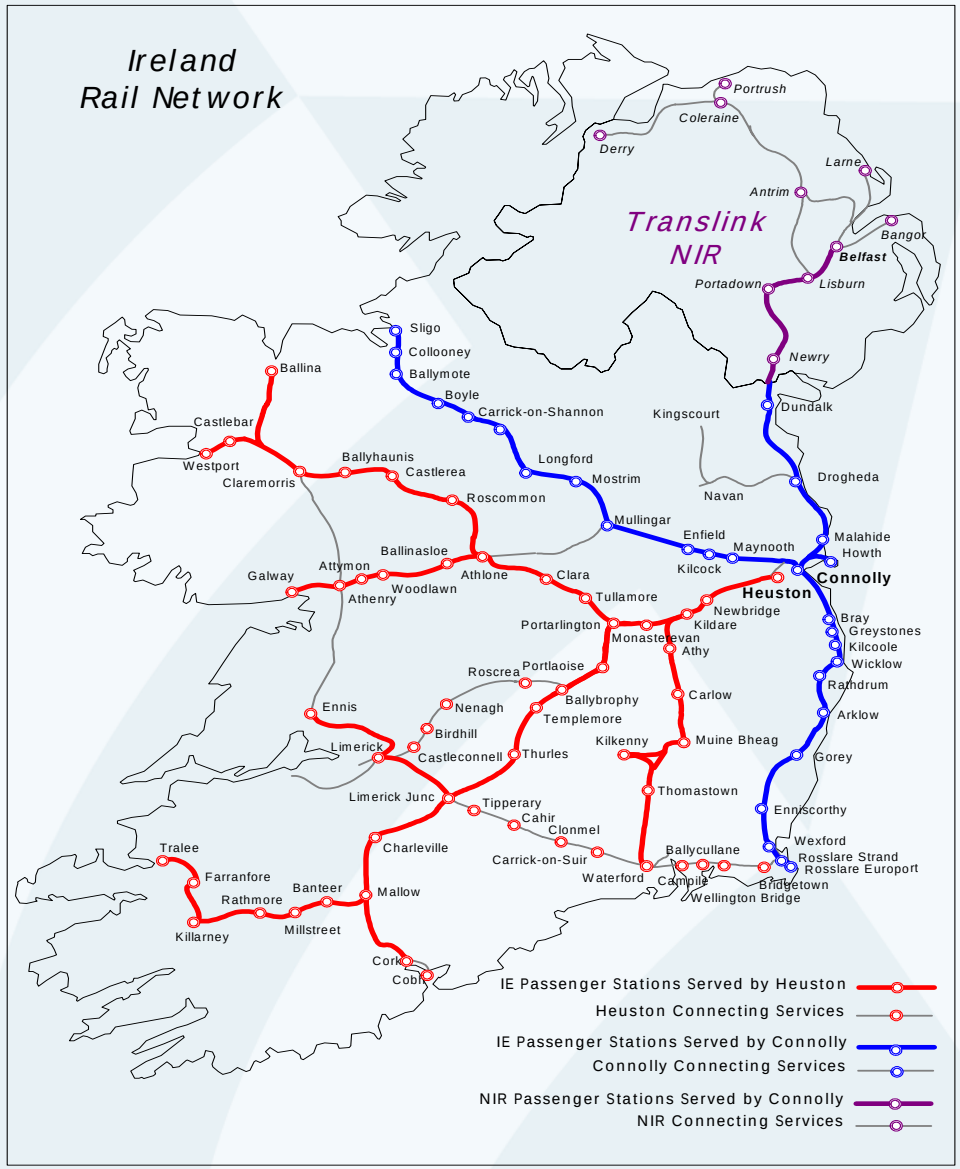

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Irish Rail

- 2000 route kilometres of which 25% is double track.
- 90% of train movements under ATP or CAWS
- Maximum line speed 160km/hr
- 95% of business is passenger based
- Daily ridership 150,000, ⅔ suburban rail and ⅓ inter-city

1997 – Knockcroghery Accident

- All 7 carriages of BR MK III consist derailed.
- Train divided
- Significant damage to track and to bogies and under-frames of rear 4 carriages
- 180 passengers but only 3 minor injuries
- Raised serious infrastructure safety concerns

Review of Railway Safety

Assess adequacy of:

- Safety policy, systems, risk assessment and prioritisation of safety investment
- Implementation of safety rules and procedures
- Infrastructure including track, signalling and level crossings
- Safety regulatory arrangements

And to

- define ‘unreasonable risk’

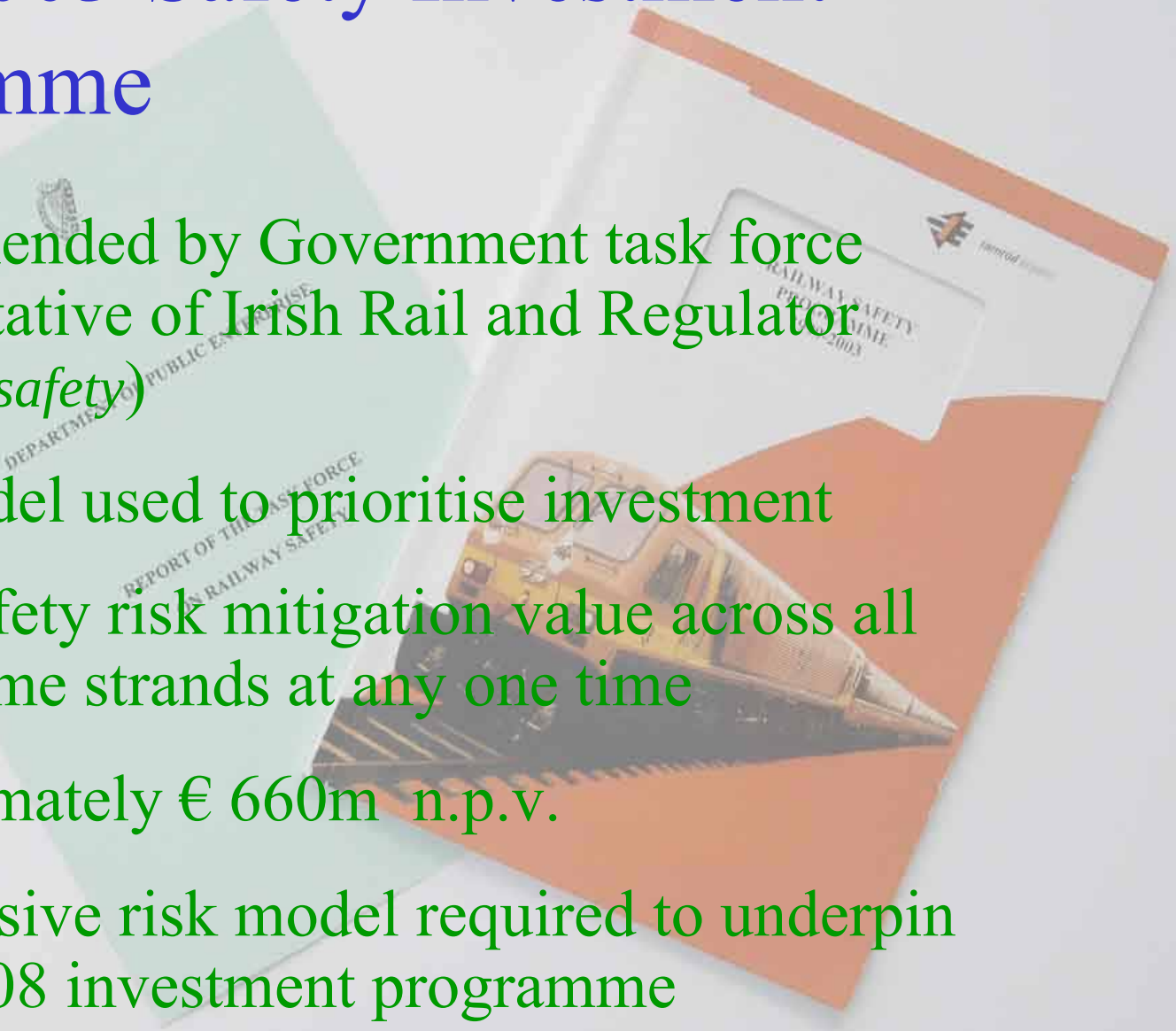
1998 - IRMS Report

- Major improvements required to large sections of infrastructure in short (*immediate*) medium (*0-5 years*) and long (*5-10 years*) terms
- New mandate for Railway Inspectorate within updated regulatory framework
- Risk model based on infrastructure asset condition and rail traffic profile (*did not include human factors, rolling stock condition or level crossing risk*)
- Highest risk on better track with high train movements and passenger numbers

Railway Safety Bill 2001

- Responsibility for management of risk resides with creator of risk (*duty holder*)
- Regulator provides guidance rather than mandating standards
- Duty holder demonstrates adequacy of safety management to Regulator in a Safety Case
- Regulator ‘polices’ safety case and has powers of enforcement
- Investigation of accidents functionally separate

1999-2003 Safety Investment Programme



- Recommended by Government task force representative of Irish Rail and Regulator (*business/safety*)
- Risk model used to prioritise investment
- Equal safety risk mitigation value across all programme strands at any one time
- Approximately € 660m n.p.v.
- All inclusive risk model required to underpin 2004-2008 investment programme

1997 Level Crossing Risk Assessment

- 1862 level crossings assessed out of c. 2000 total
- Included public/private, automated/manually operated, attended/un-attended.
- Assessment based on road/rail usage, condition, historical performance
- Tolerability limits established within ALARP framework

Development of risk model

- Ownership transferred from regulator to duty holder
- Trial model based on small representative section of network to prove concept
- Limited statistically significant performance data so model largely predictive
- Jointly developed by Irish Rail and consultants Sotera

Model Content:

- Model pulls together:
  - Asset assessment (*Hazid and FMECA to generate condition rating*)
  - Safety management (*Policy/Organisation/ planning/implementing/reviewing*)
  - Human performance (*Criticality of role/task analysis/management system rating*)

Model Scale:

- Full run time including approximately 2-3 weeks (*Excel based supported by Fault Tree +*)
- Development process included 250 hazard and risk workshops
- 227 functional locations as opposed to 37 in original model
- 15300 assets condition rated (*track/structures/level crossings/ signals/P & C/track circuits/rolling stock*)

Model Scope

Included:

Risk to:

- Passengers, staff, public and contractors

From:

- Equipment failure
- Operational errors (*eg SPADs*)
- Maintenance error
- Third party acts (*eg, vandals*)
- Weather/environment

On:

- The operational railway, depots, workshops, sidings adjacent property affected by the railway

Excluded:

- Suicide
- Occupational Health and Safety Issues in offices
- Environmental harm from the operational railway
- Failures that have an exclusively operational impact
- Long term occupational health issues
- Incidents on roads and pavements on the approach to railway premises

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Model results:

- Risk on two route sections and to one employee group intolerable.
- For equivalent track section predicted higher risk than original 1998 model.
- Predicted risk tends to be higher than evidenced by accident/incident data
- Model predicts that 2004-2009 safety investment programme will reduce baseline hard asset risk by 40% (*2.7 Equivalent Fatalities*)

Demonstration of Safety Adequacy

- Guidance and best practice taken into account in contemporary ‘approved’ works
- Older un-approved works operated under ‘grandfather rights’
  - Do not typically satisfy provisions of guidance or reflect best industry practice
  - Safety adequacy demonstrated by showing that risk is tolerable and has been mitigated ‘in so far as is reasonably practicable’

In conclusion:

Risk modelling is

- A valuable analytical discipline for the railway undertaking
- Underpins safety investment and safety case
- Tool to monitor safety programme delivery
- Assist the regulator in assessing safety adequacy

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