



# **Resistance is Useless.**

**Peter Symons IRSE President**



# **My Text for today**



## **Strategic Drivers of change in the Signalling Industry**

*Written and edited by Alan Rumsey on behalf of  
the International Technical Committee of the IRSE*

# International Technical Committee (ITC)



- The ITC mission is to provide a multi-national and independent perspective on Railway Control, Command and Signalling (CCS) topics
- It produces reports and articles on selected topics to inform and educate both IRSE members and the train control and communications community worldwide
- ITC Membership is by invitation, and comprises industry experts from both suppliers and operators, drawn from over a dozen countries around the world

<http://www.irse.org/knowledge/public/itc.aspx>



# Agenda



## Drivers of Change

1. user/specifier of signalling system
2. supplier/provider perspective



# Drivers of Change from the Perspective of Users/Specifiers

# Emphasis on System Safety



## Re-definition of "Safe State"

No longer good enough to just stop trains

A stopped train doesn't meet its fundamental mission to transport people and/or goods

BOTH "fail-safe" AND system degradation need to be considered in system design



Hoboken, NY 2016

**Holistic view needed of transportation operations**

# Emphasis on System Safety



## Application of ALARP or more correctly SFAIRP

Safety is not absolute

Residual Risk remains after SFAIRP mitigations

Risk needs periodic reassessment

- e.g. increase in line capacity – increasing likelihood of a hazard occurring
- New technology making further risk reduction viable
- Leverage experience of other users



Parkville, NSW 2016

**Vigilance in assessing effects of change**

# Emphasis on System Safety



## Cyber Security

Historically Rail Industry Safety HAS NOT included Security

Need to deal with cyber security threats STUXNET, WannaCry, Triton etc.

Signalling technology architectures will need to integrate security

Safety Management System –  
Safety and Security Management System

Cyber-attack "Wanna Cry" attack paralyzes railway announcements and vending machines



Bitcoin demand

**Security is integral to Safe Operation**



# Increased Focus on Operations



## Capacity

Maximise operational utilisation by

- Using Moving Block
- Control Centre Consolidation

Consider alternative safe braking models not based on a “Brick Wall” stop of a preceding train.



**Removal of Signalling System constraints**

# Increased Focus on Operations



## Automation

Grade of Automation	Type of Train Operation	Sets Train in Motion	Stopping Train	Door Closure	Operation in event of Disruption
GoA1	ETCS L2 With Driver	Driver	Driver	Guard	Driver
GoA2	ETCS L2 & ATO With Driver	Automatic	Automatic	Guard	Driver
GoA3	Driverless	Automatic	Automatic	Train Attendant	Train Attendant
GoA4	Unattended Train Operation	Automatic	Automatic	Automatic	Automatic



# AutoHaul®



**RioTinto**

Australia's first fully  
autonomous train run

▶ ▶ ◀ 0:03 / 0:54



# Increased Focus on Operations



## System Reliability/Availability/Maintainability

Next Gen Technology

More **R**eliable

More **A**vailable

More **M**aintainable

Reliability Centred Maintenance - Condition based

Asset health monitored - low cost sensors and communications systems



**Aim better service recovery – Failure Must be a rare event!**

# Increased Focus on Operations



## Big Data

Trackside and on board systems capture large amounts of data

Can be overwhelming to users

More integrated System Analytical tools

More efficient and effective response to alarms and incidents

Singapore Nov.  
2016  
"Rogue train" to  
blame for signal  
interference,  
disruptions on Circle  
Line

Rogue Train caught  
by Big Data

<https://goo.gl/bEh17z>

**Can't See the Wood for the Trees - Data scientists**

# Increased Focus on Operations



## Low Cost Solutions

Commercial – beyond Interoperability -  
Interchangeability

Obsolescence – Type Approval safety  
assurance processes onerous and time  
consuming

Lifecycle Cost – Operational Cost  
trending as larger than Capital Cost

Justifying a Business Case is hard



**EULYNX**

<https://youtu.be/m4XpuUcfk2E>

**Standardised Interfaces + efficient Safety Assurance**



# Drivers of Change from the Perspective of Suppliers/Providers

# Maintaining a Competitive Edge



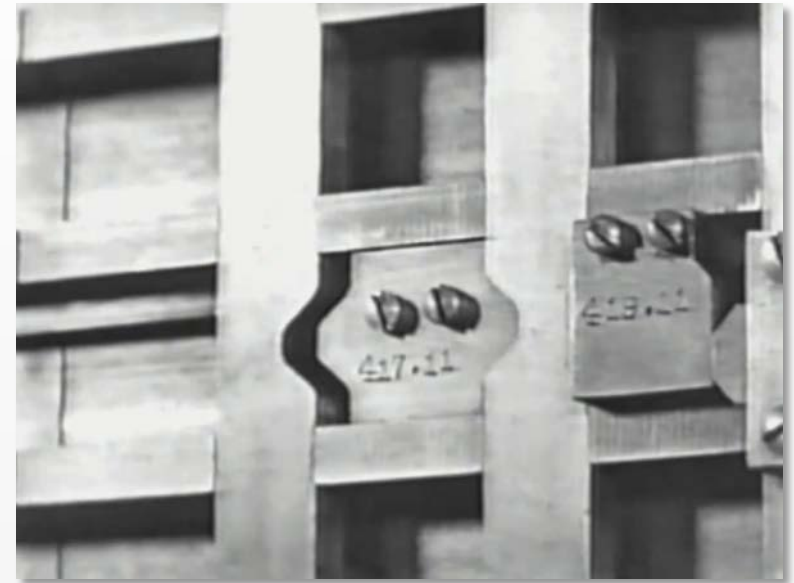
## More Efficient Engineering Processes

- Less competent resources available
- More design tools – formal methods
- Cost effective System and Safety Assurance processes

## Implementation Costs

Enhanced “Laboratory” testing to minimise on site testing

- Sophisticated Simulation tools
- Formal methods



**Do more with less – quicker**

**People are Key**



# Maintaining a Competitive Edge



## Hardware Costs

- More COTS products
- More specialised Apps using low cost sensors
  - Monitor asset condition

## Trend to Moving Block Systems

- Fail safe monitoring train location
- Determine train length and train integrity
- Confirm route integrity



Dragging Equipment Detector

**Development of low cost sensor technology**

# Maintaining a Competitive Edge



## Software Development Costs

Software is key

Vital and non-vital software must be bug-free

Software must be portable to new hardware with minimal new safety assessment

## Flexible Update and Upgrade Scenarios

Replace only life expired subsystems instead of complete systems

Backwards compatibility an issue

User desire for reduced lifecycle cost a big driver

**Current market behaviour of the supply industry needs to change**

# Global Solutions/Products



## Technology Convergence

Railway systems market is segmented

e.g. Metro/Mainline/Heavy Haul

Many user business requirements are common across these segments

More convergence expected – fewer products

Industry Consolidation – rationalised product ranges



**Increased globalisation – less choice?**

# Global Solutions/Products



## Communications Technology

Evolution of say GSM-R to LTE, LTE-R, 5G ... will drive changes to signalling technology to meet user requirements in Section 1

The access to cost-effective and efficient radio technologies will continue to be a critical issue for signalling (in the widest sense) system design

Consequence more On-board signalling systems needing integration and interfacing to other train borne subsystems



**Emerging constraint - Spectrum availability for Rail**

# Summary



- Continued Emphasis on system safety
- Increased focus on operations
- Drive to lower cost signalling solutions
  - Maintaining a competitive edge
  - Technology convergence to global solutions/products
  - Increased dependency on communications technology



# Finally

“the only thing constant is change” **so pay attention and keep up**



Use the force of being a member of The IRSE



**Thanks for your attention**