

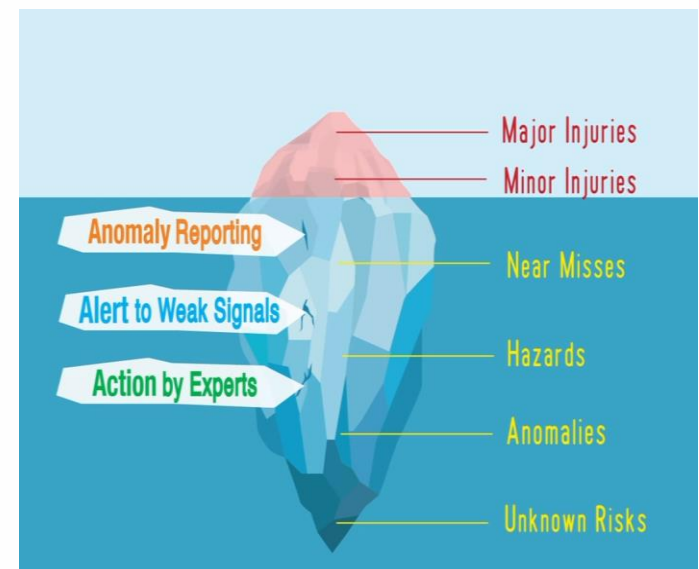


# Advancing to a High Reliability Organization (HRO) – the Experience of a Railway Operator

**Nelson Ng**  
General Manager – Hangzhou Line 5

**Bryan Cheung**  
Senior Manager – System and Safety Intelligence

IRSC, 25 October 2017



# High Reliability Organization (HRO)

- “An organisation that has succeeded in operating **complex high risk processes** without a **catastrophic event** despite the significant hazards, time constraints and complex technologies inherent in its operations”
  
- How can the HRO companies **continue** to have excellent safety performance ?



# 5 Common Characteristics of HRO

*For organisations to maintain "mindfulness" for unexpected situations*

## Preoccupation with Failures

- Organisations must emphasise on failures more than successes – clearly and quickly understand causes of failures and take rapid corrective actions

## Reluctance to Simplify

- Organisations must not go the easy way to assume and simplify what is going on & wrong

## Sensitive to Operations

- Executives & managers shouldn't look at the organisations & activities merely from big-picture level

## Commitment to Resilience

- Organisations need to be capable to detect, contain & bounce back from errors & problems

## Deference to Expertise

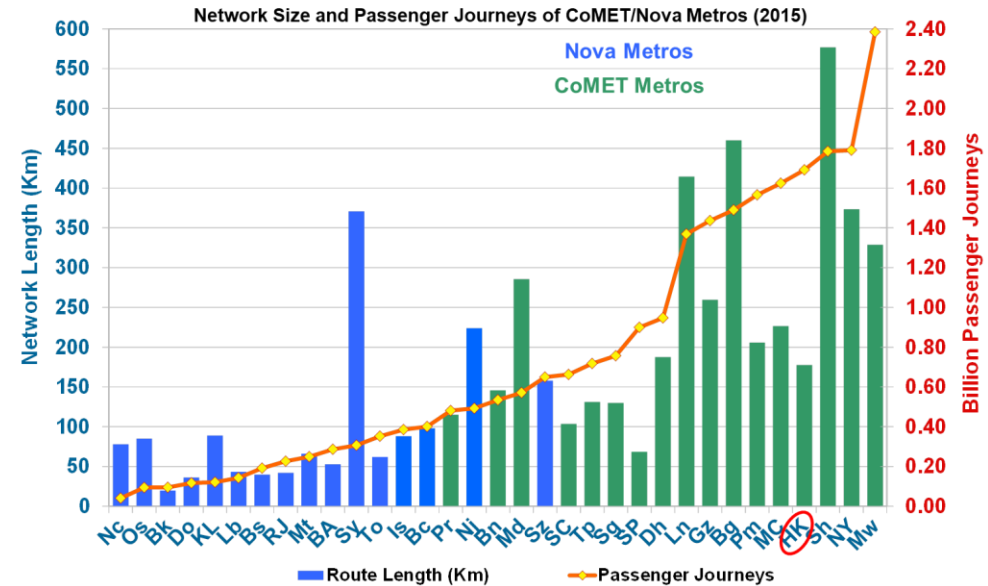
- Organisations need to adopt a paradigm that allow they gain access to the expertise of operators and maintainers at the front line who know what is going on and probably can identify and solve problems on the ground before they get out of control



# Why HRO also applicable to MTR

- MTR strives to upkeep a world-class performance in safety and train service punctuality of over 99.9%
- However “minor” incidents due to equipment failure, human factors and external factors are inevitable
- The reputation impact is “high” due to the high patronage thereby easily attracting public and media attention / criticism.
- Catastrophic incidents often occur in the railway industry - world-wide railway incidents keep reminding us not to be complacent

## MTR is one of the busiest high density metro



# HRO Journey in MTR – Started in 2014

*“HRO accept that catastrophic events can occur if not managed properly and management systems are typified by a mindfulness toward establishing redundant controls, use of simulations to identify all possible error modes, focus on training and use of highly skilled employees, refined organizational structure, decentralized decision making, and learning from mistakes.*

*These characteristics create processes and systems that mitigate undesired events and build resiliency to recover from them much faster with minimum disruption.*

*This path leads toward better reliability and creates a vigilance toward identifying precursor anomalies and small failures early before they can become system disruptions or larger accidents.*

*MTR already exhibits several of these cultural values and the further cultivation of them is needed to support and sustain a more complex asset management system.”*

**Remarks by APTA during external review of Safety Management System of MTR in 2014**

- Complacency is not an option
  - Expanding network and increasingly complex operations and assets
  - Workforce retirement and transition
- Room for continuous improvement
  - strengthen and integrate processes
  - enhance safety reporting culture
- HRO helps unveil and evaluate systemic weaknesses
  - all staff become mindful of potentially high consequence risks
  - more vigilant to detect anomalies



# HRO Test – On the Right Track

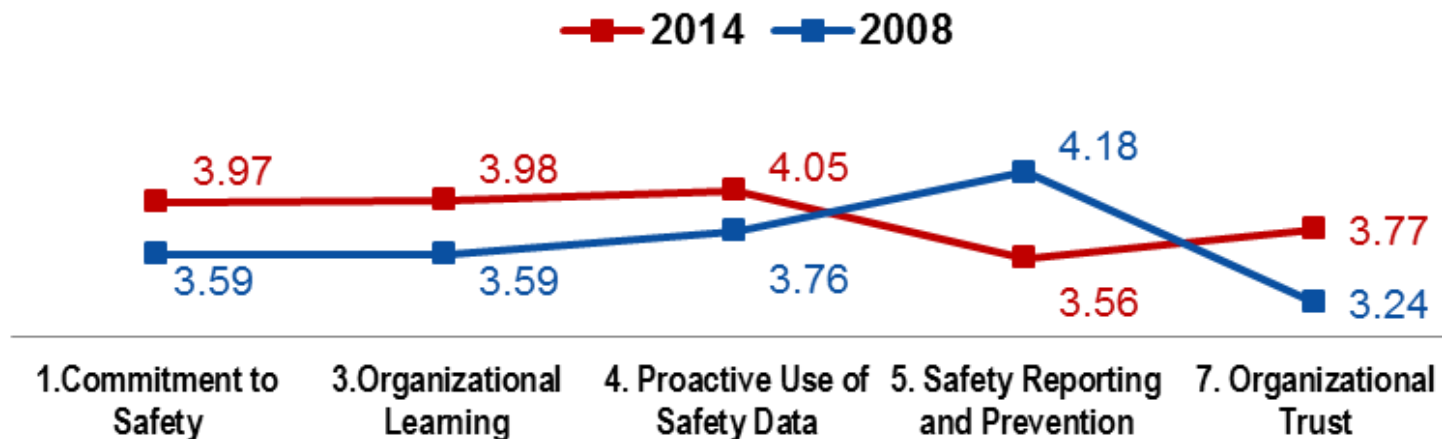
- Our people, organization, systems and processes did exhibit many of the HRO attributes and mindset
- Affirmed that we are on right track and should commit to becoming an HRO

<i>Preoccupation with failure</i>		<ul style="list-style-type: none"> <li>- emphasize on identification of failures, from recording of failure information to sharing information and lessons learnt throughout organization</li> <li>- has some leading indicators and systems (e.g. precursors, hazard reporting) instead of lagging indicators to look for potential warnings</li> <li>- actively uses audits / reviews to check deviations and responds positively to improve</li> <li>- follows up on outcomes of incidents and communicate in a timely manner</li> </ul>
<i>Reluctance to simplify</i>	to	<ul style="list-style-type: none"> <li>- leadership takes time to go through each incident in details, to find root cause and convert improvement areas to actual actions</li> <li>- management requests further and in-depth reviews and investigations, applying rigorous root cause analysis to seek complex but real explanations to problems</li> </ul>
<i>Sensitivity to operations</i>	to	<ul style="list-style-type: none"> <li>- great attention to and cautious about situation in front line, where real work gets done</li> </ul>
<i>Commitment to resilience</i>	to	<ul style="list-style-type: none"> <li>- developed methods to manage unexpected events &amp; resume operations asap</li> <li>- developed a robust system for managing crisis where special teams are mobilized</li> <li>- conduct regular drills and exercises</li> </ul>
<i>Deference to expertise</i>	to	<ul style="list-style-type: none"> <li>- provide multiple forums for staff to voice out concerns; diverse opinions are valued</li> <li>- consult experienced staff to help understand issues and make decisions</li> <li>- empower front-line workers to solve problems at their level</li> <li>- reward reporting of problems and errors</li> </ul>

## HRO Test

# Initial focus – Enhance Safety Reporting

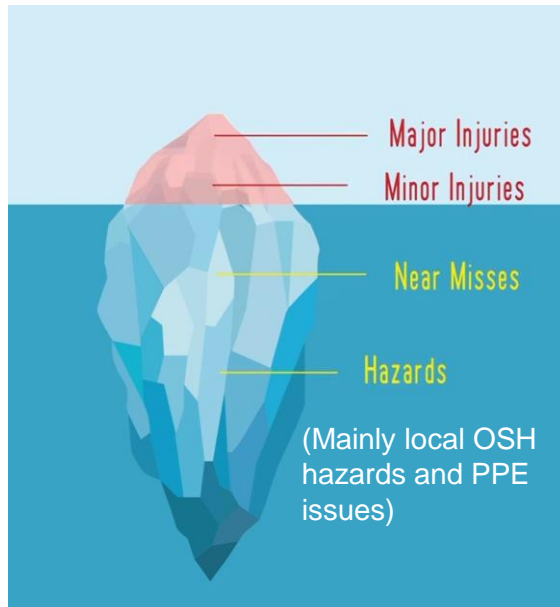
- One driver behind HRO was the result of Safety Culture Survey in 2014
  - Compared with that in 2008, improvement was observed in all categories except for safety reporting
- Scores at a reasonably positive level but the trend was not favorable
- “Reinvigorate reporting culture” among workforce
  - Not just OSH and local hazards
  - Report anomalies and analyse weak signals systematically to prevent potential catastrophic events





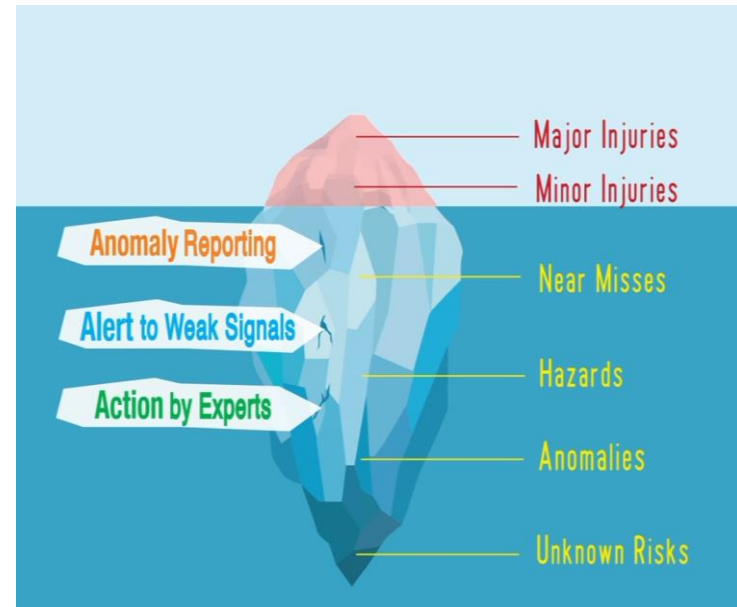
# Changing the Reporting Regime and Behaviours

From



- Report accidents and injuries
- Report OSH and local hazards and near misses (HNM)

To



- Also report **anomalies**, **new issues/changes** & unknown risks
- Capture weak signals which potentially can **escalate** as a major incident

# AAA – A strengthened reporting programme

## Anomaly reporting

(by frontline staff on-the-ground)

- **Anomaly** refers to an abnormal condition / situation that fulfills one or more of the following criteria:
  - *Unusual; Unknown Cause; New Issue*
  - could lead to *a single or multiple serious safety consequence(s)*, such as derailment, train/vehicle collision, fire, struck by train/vehicle, escalator incident, falling object, slip/trip/fall, platform train interface.

## Alert to weak signals

(by Landlords, supervisors; Supported by safety experts)

- **Weak signals** refer to an adverse trend / group of similar anomalies which could escalate to serious consequence.

## Action by experts

(by subject matter experts e.g. engineers, operators, human factors specialists and safety committees)

- **Action** - carrying out **further analysis of the cause and follow-up**, in order to prevent recurrence and escalation to a serious consequence



**Anomaly** • **Alert** • **Action**

# Results of trial of AAA in MTR (one line)

- Overall, the AAA trial was completed with positive results

## 3-4 times

### Behaviours affected –

AAA was run as a programme in parallel with the existing hazard near miss reporting programme.

## 79%

### Mindset influenced –

a stronger reporting awareness.

## ~90%

### Knowledge developed in staff –

Correct understanding on the objectives and definitions of the AAA programme elements

*“the AAA program is well-designed and well-functioning for identifying, tracking and analyzing system anomalies and weak signals for corrective action.*

*It has produced a wealth of new information, much of which would not have otherwise been reported or known. Numerous corrective actions have been taken to proactively mitigate the identified risks”.*

*Remarks by HRO expert team in 2016 peer review*

# Critical Success Factors behind the results



Continuous promotion and education

Anomaly, Hazard and Near Miss Report Form  
 異常、隱患及準失事事件報告表  
 Information 呈報人資料  
 Staff Number 員工編號  
 Phone Number/Email 聯絡電話/電郵  
 Department 部門  
 Section/Sub-section 組別/分組  
 Work Location 工作地點  
 Signature 簽署  
 Anomaly is: 1. Abnormal condition situation that fulfills at least one of the criteria on the right. 2. ...  
 Hazard is: In a source, situation or act with a potential for harm in terms of human injury or ill health, or a combination of these.  
 Near Miss is: An unplanned event that did not result in injury, illness, or damage - but had the potential to do so.  
 Anomaly/Hazard/Near Miss Information 異常、隱患或準失事事件資料  
 Date & Time of discovering Anomaly/Hazard/Near Miss 異常、隱患或準失事事件發現日期及時間  
 Location 地點  
 Anomaly/Hazard/Near Miss description (please add photo or separate sheet, if necessary) 異常、隱患或準失事事件詳情 (如有需要, 可加相片或附頁)  
 Action taken (if any) 何時採取之行動 (如有)

Simple reporting method



Management support



# Full network rollout of AAA

AAA programme expanded and rolled out to the whole network since late 2016

*“The AAA trial program is well positioned to be more fully integrated into a rollout strategy across the MTR system, and could serve as a key leverage tool for implementing a more broadly-based HRO program.”*

*The peer review team recommends MTR proceed with rolling out the AAA program throughout their operating system while more fully integrating AAA with other safety reporting tools.”*

**Remarks in the peer review by HRO experts in 2016**

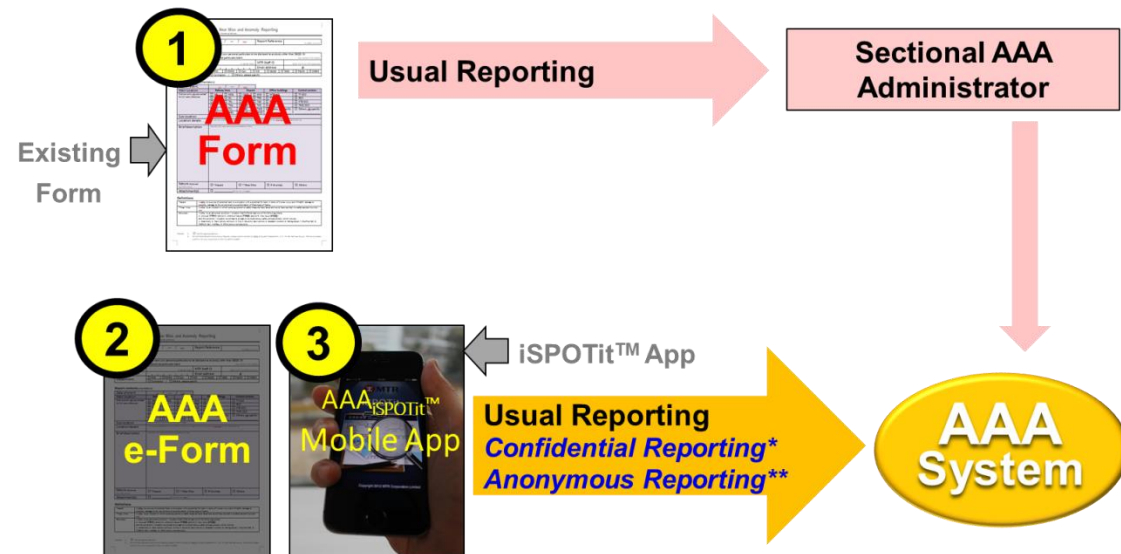




# Enhancing the Critical Success Factors

## - Simplified and Integrated Reporting Channels

- The Trial was run in parallel with the existing Hazard Near Miss (HNM) Reporting programme
  - Staff mixed-up on the use of two forms during early introduction
  - Need to promote when and how to report under the new AAA scheme
- During full network roll-out, AAA integrated into existing HNM reporting form
  - Expanded the mobile App “AAA iSPOTit” to allow staff to report both hazard near miss and anomaly
  - Facilitates systematic capturing of all anomalies for analysis across systems and avoid premature filtering





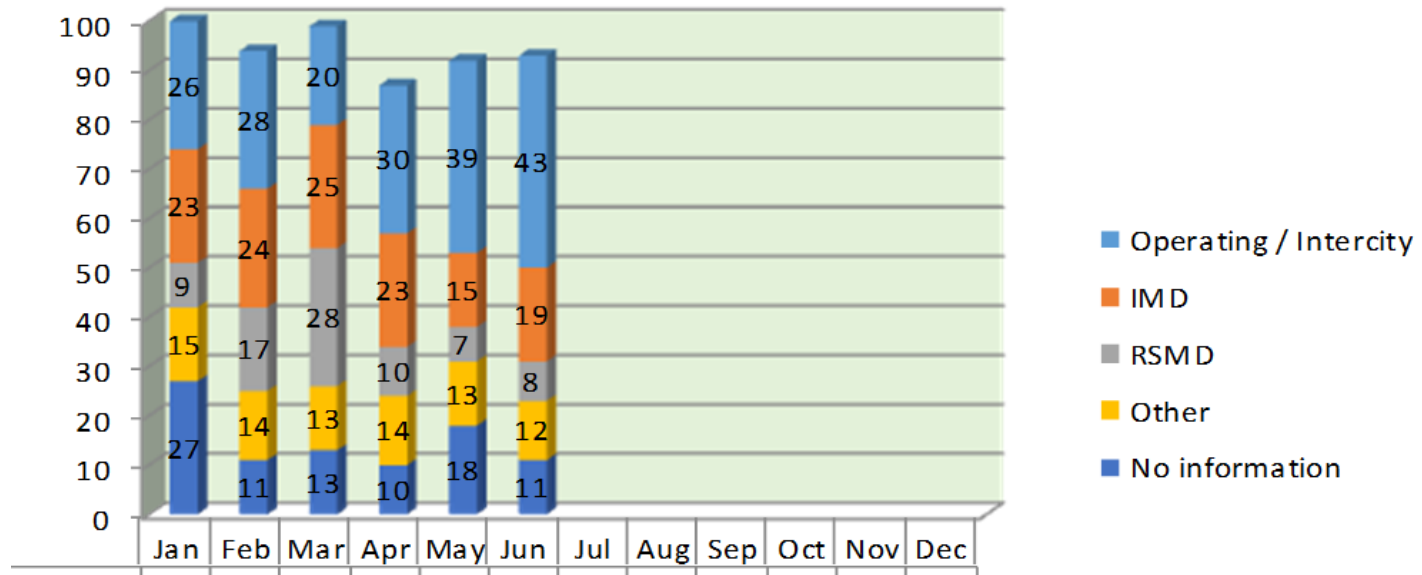


# Results for full network rollout

## - Quantitative

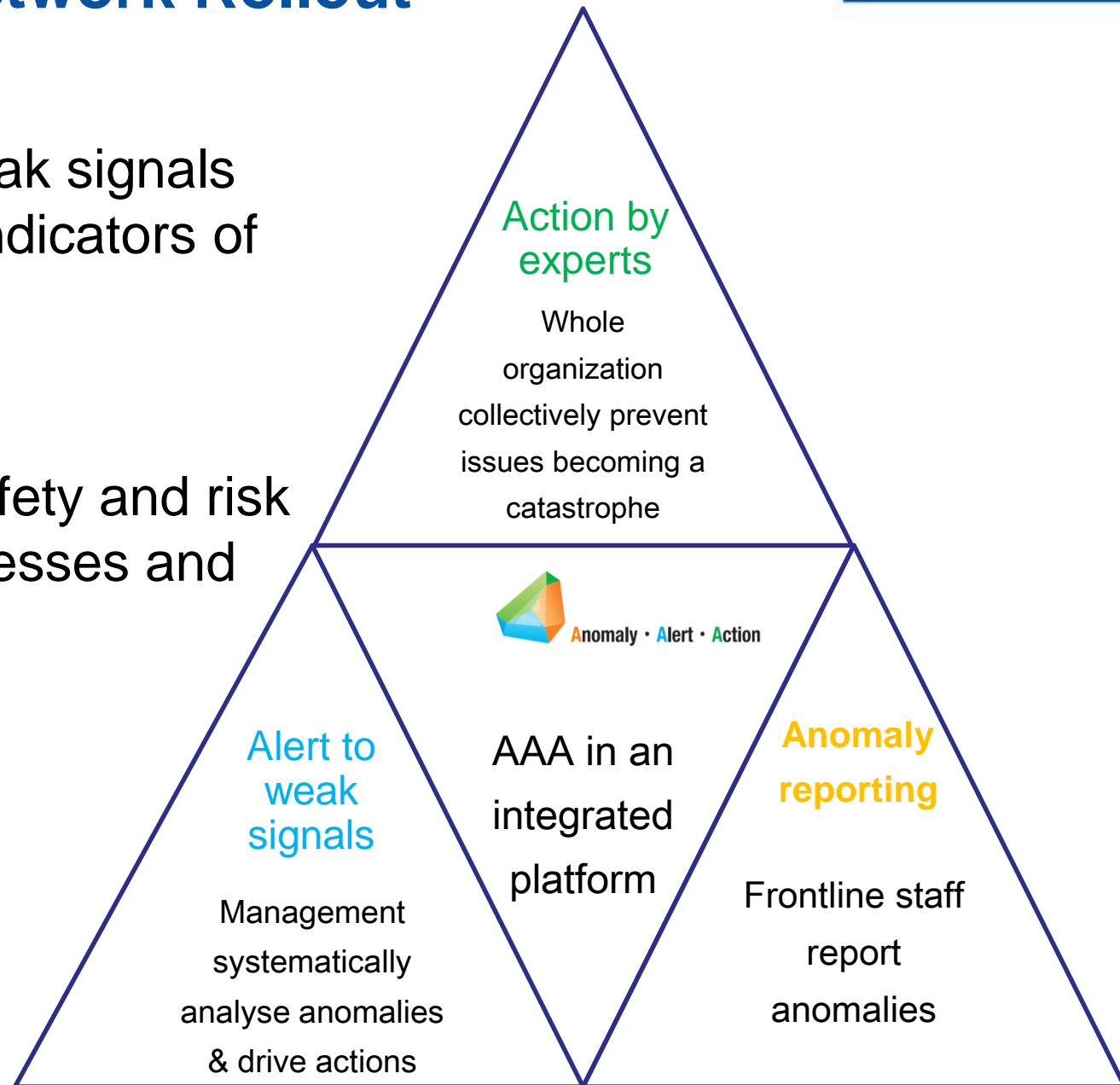
- Over 500 AAA cases were reported in the first half of 2017
  - represented a 300% increase in the number of reports compared with the HNM scheme in the first half of 2016
- Provided positive competition among teams, and data for further analyses

**2017 AAA Monthly Statistics - by Submitter's Department**



# Results of Full Network Rollout

- Anomalies and weak signals provided leading indicators of significant risks
- Useful inputs to safety and risk management processes and organisations

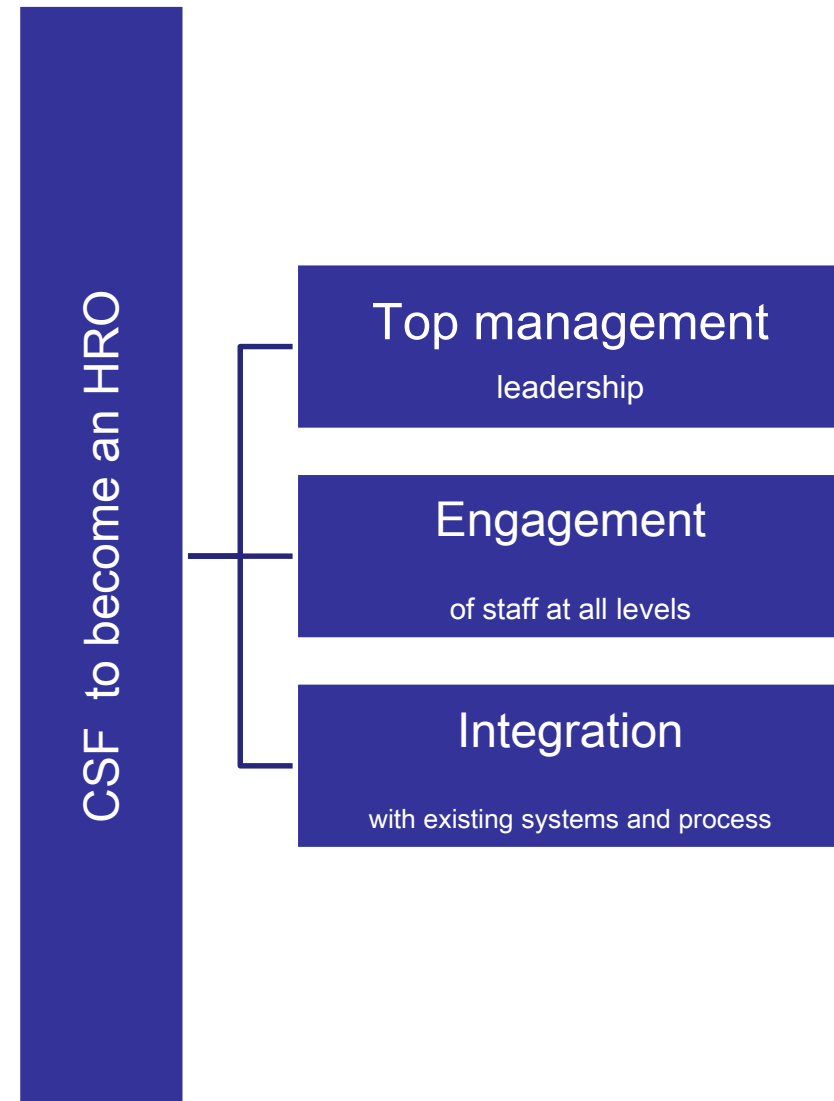


# Full Network Rollout and Next Steps

- While initial results were satisfactory, attaining full benefits of HRO require further efforts
- Risk of frontline workers & line managers having less ownership and involvement unwittingly
- Enhancing staff engagement, organization and processes
  - Evolve from “An anomaly reporting tool” to “Broader concepts of HRO”
  - Further empower front-line decision and resolution on the ground first during an off-normal event
  - Further ingrain HRO characteristics into existing workforce, organization and process holistically

# Conclusions

- HRO strengthened MTR's quest for continual improvement in both safety and service reliability
  
- HRO(AAA) full integration under SMS enhances:
  - ✓ Safety Culture of every staff
  - ✓ Organization agility to detect anomalies and significant risks
  - ✓ Resilience to unknown risks and unexpected situations



# Thank you

**27<sup>th</sup> International  
Railway Safety Council  
2017**

