



30TH WESTMINSTER LECTURE ON TRANSPORT SAFETY

# Reflections on 18 years as a railway accident investigator

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In association with:

Delivered at the Royal Automobile Club, Pall Mall, London  
**11TH APRIL 2022**

## Acknowledgments

PACTS wishes to thank Mr Simon French OBE for delivering the lecture and providing this text.

We also thank Baroness Vere, Minister for Roads, Buses and Places, for her introductory address to the lecture.

The event was organised by PACTS in partnership the RAC Foundation and with support from Burges Salmon LLP. PACTS is grateful for their support.

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PACTS held the first Westminster Lecture on Transport Safety in 1990. It is proud to have sustained this tradition over many years. Many leading figures in transport safety from around the world have kindly accepted the invitation to speak. The full list of Lectures is provided in the Appendix.

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## Reflections on 18 years as a railway accident investigator



**Simon French** OBE, BSc (Econ) Hons CMIOSH  
Former Chief Inspector, Rail Accident Investigation Branch

Simon French is a graduate of the London School of Economics and joined the railway industry in 1982 as a management trainee. He held a number of operational posts in British Rail and worked on several major railway projects including the Channel Tunnel and Heathrow Express. In 1998 he joined the client organisation for the Channel Tunnel Rail Link (now known as HS1) as the Head of Operations and Safety. In 2004 Simon joined the newly formed Rail Accident Investigation Branch (RAIB). The RAIB is the independent body tasked with the investigation of railway accidents in the UK. After six years as Deputy, in 2015 he was appointed to the role of Chief Inspector. He retired in March 2022 after 40 years in an industry that he loves.

## Introduction

Good evening, everybody and thank you to PACTS for the invitation to deliver the Westminster Lecture for 2022. First of all, let me introduce myself, my name is Simon French, and I am, first and foremost, a railway professional. I graduated from the London School of Economics in 1982 and decided to join British Rail as a management trainee, based in the Western Region. In my first year or so I witnessed the aftermath of a railway accident when the night sleeper train from Penzance overturned on the final approach to Paddington station.

I later moved to the Southern Region and was the traffic manager at Dover with responsibilities which included the boat trains which connected with ferry services to France and Belgium, and the train ferry to Dunkerque.

This was followed by six years with the binational Channel Tunnel project, where I remained until well after the start of commercial services.

After several more years working on a range of operational and safety projects in the UK, Denmark, Hong Kong and Singapore I became the Head of Operations and Safety for HS1, the UK's first Ligne Grande Vitesse.

After six years, the first section of HS1 opened and I decided it was time to return to the core railway and get my boots back on the ballast. So, in July 2004, I joined the newly created Rail Accident Investigation Branch, initially as a Principal Inspector and was promoted to Deputy Chief in 2009. In 2015, I was privileged to be appointed as Chief Inspector, a post which I held until my retirement in March 2022.

My talk this evening will focus on five key themes:

- Why it is important to learn from experience
- The role of rail accident investigation bodies, past and present
- Risk awareness
- Management assurance
- Organisational safety culture

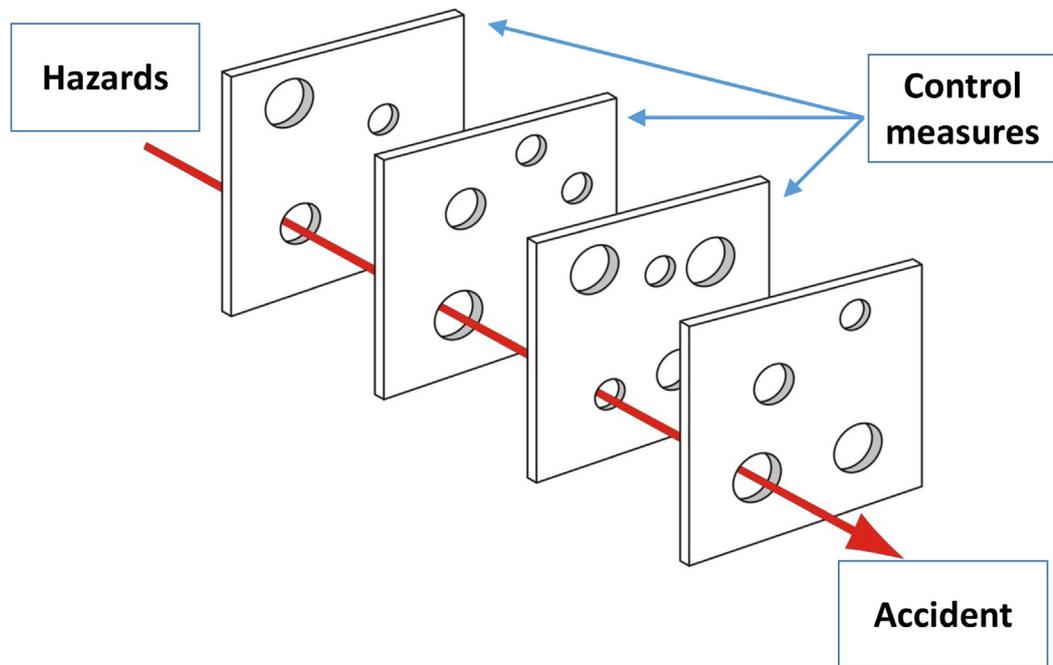
I will then conclude by reflecting on the challenges that the railway must address if it is to continue to improve safety in the years ahead.



**Figure 1:** Stages in my career

## Why accidents happen

I will start by talking about Professor James Reason's famous Swiss Cheese model of accident causation. The model presents an organisation's defences against failure as a series of slices of cheese, with holes. The holes in the slices represent weaknesses in individual parts of the system that are continually varying in size and position across the slices. Accidents take place when a hole in every slice momentarily aligns, permitting a "trajectory of accident opportunity".



**Figure 2:** Professor James Reason's famous Swiss Cheese model of accident causation

What does this model mean in the context of a railway organisation's safety management arrangements? The slices of cheese are the control measures, and the holes are the gaps in the safety defences. The safety threat is that the holes align, the risk is the combination of the likelihood that the holes align, and the consequences should this occur.

Good safety management is about taking the actions needed to avoid a trajectory of accident opportunity due to holes aligning. Actions can include the inclusion of another slice of cheese (another layer of safety defence), removing or reducing the size of the holes (addressing areas of weakness) or realigning the safety defences so that the holes are very unlikely to ever align.

James Reason's model, and for that matter any competent model of accident causation, suggests that accidents can be avoided by identifying weaknesses in safety defences and addressing these; in other words, making the holes in the slice less in number, smaller or less likely to align. One means of achieving this is a process of corporate learning that translates experience into tangible safety improvements.

## Learning by experience?

Experiential learning is a real thing – as children, we learn to walk and discover that falling over can be painful, as can walking into a table when you're only three feet tall. For my part, I have learnt, the hard way, several times, to double check that the power is off before wiring a plug. Similarly, organisations should learn from their mistakes, seeking to close gaps in their safety defences, protecting their people and customers from harm.

Let me present an example, a real incident that occurred one summer morning.

It involved a train passing a signal at danger on a mainline route. It also involved a handsignaller whose job it was to authorise trains to pass a signal that could not be cleared due to the failure of a track circuit. Before doing so the handsignaller was required to seek permission of the signaller whose job it was to route trains across the junction.



**Figure 3:** An incident that occurred one summer morning

So, the scene is set – the handsignaller is waiting at the signal with a set of flags. As a train approaches, he calls the signaller and asks for permission to authorise the approaching train to pass the signal at danger. Once that permission is granted, he confirms his understanding. By now the train is standing at the signal – the handsignaller duly instructs the driver to pass the signal at danger and to obey all other signals. He then displays a yellow flag, and the train is able to proceed on its journey with only a few minutes delay.

This happens three times without incident.....and then the fourth train approaches. Once again, the handsignaller authorises the train to pass the signal at danger and displays a yellow hand signal. However, this time, he hasn't called the signaller. He realises his mistake as the train is passing but it's too late, the train is heading towards the junction.

The handsignaller is horrified and stands transfixed as the train approaches the junction, crosses it and, thank goodness, passes safely clear. He wonders what to do....no harm is done but there could have been another train routed across the junction. He decides to call the signaller. The signal box supervisor answers and tells him not to worry, he says *'these things happen'; 'you're alright mate'; 'no need to report it'; 'too much paperwork, best not mention it again'*.

The handsignaller decided enough was enough and informed the signal box supervisor that he was no longer fit for duty, and they would have to manage without a handsignaller. So, he went home with a feeling of deep unease about what had happened, and he did not report for fear of the repercussions for him and the signal box supervisor.

He never mentioned the incident again for another 38 years, until giving the Westminster Lecture at the end of his 40-year career in the railway industry.

I have never forgotten the event and how different the consequences could have been had a train being routed across the junction at the same time. A very minor incident, perhaps, but with the potential to cause a collision. So, what lessons could have been learnt from such an incident?

First and foremost, this incident highlights the capability of any human being to make a mistake. This particular human being was reasonably intelligent and motivated to get it

right. This human being only wanted only to help the railway operate effectively and safely. However, the potential for error was hard wired into the handsignaller; and every one of us.

Had this incident been reported and been the subject of any kind of investigation a number of other issues could well have been explored. A number come to mind:

- how was such an inexperienced person allowed to perform safety critical duties at a busy mainline junction?
- why did the handsignaller feel obliged to perform duties that he had not been trained to undertake?
- why was he asked to perform safety critical duties at the end of a 12-hour shift?
- how was the risk of fatigue being managed by the railway company?
- what did the organisation know about the lack of training, and if it knew, why was nothing done?
- the effect of a macho culture and the perceived need to always to be seen as willing to help to keep the railway running?

So, even the most 'minor' of incidents carries with it a rich seam of learning about the individual, their task and the organisation. The question is ...how best to 'mine' this seam of learning, and then how to exploit it.

## The investigation of railway accidents

In the UK, government has played a particular role in the investigation of railway accidents, culminating in the creation of the Rail Accident Investigation Branch. How did this relatively unusual government role develop in the first place and how did it change over time?



**Figure 4** Recent train accidents at Salisbury and Carmont

The first widely reported railway accident was the death of the Right Honourable William Huskisson who was struck by a train during the ceremonial opening of the Liverpool and Manchester Railway on 15 September 1830.



**Figure 5:** The death of the Right Honourable William Huskisson

Inspecting Officers of Railways were first appointed by the Board of Trade in 1840 with the responsibility for the inspection of railways and the investigation of accidents. Although the 1833 Factories Act had already established the principle of government inspection of private enterprises (albeit on a very limited basis), the inclusion of accident investigation in the scope of the newly appointed railway inspectors was an important milestone, reflecting the conviction of many in government and the wider public that the private railway companies could not always be trusted to get to the truth of what had gone wrong.

The first accident investigation by the newly appointed railway inspector related to a derailment at Howden on 7 August 1840, which had killed five passengers and was caused by the fall of a large casting from a wagon on a passenger train. In the years that followed the railway inspectorate carried out hundreds of investigations into railway accidents. These investigations, combined with routine inspections, gave the inspectorate an insight into the measures that were needed to reduce the horrendous number of accidents that were taking place on the railways.



**Figure 6:** Railway accident at Stapelhurst in 1865

From as early as the 1850s the inspectorate was calling for the adoption of three basic safety measures. The first of these was the interlocking of points and signals (the lock), the second was the introduction of block signalling (the block) and the third was the provision of continuous automatic braking along the full length of trains. Taken together, these three elements, lock, block and brake, form the foundation of railway safety to this day. Nevertheless, it took a truly dreadful accident at Armagh in 1889, which killed 80 people, for the government to introduce legislation to mandate that all railways provide these basic safety features.

So, there is a tradition of independent investigation by government inspectors of railway accidents and ample evidence that this helped to drive improvements. However, it would be quite wrong to conclude that safety improvements are only driven by government inspectors. There are, of course, other forces that have led to safety improvements in the railway industry. The first of these is the railway industry's long tradition of safety management. It was quickly recognised that the operation of trains, at ever increasing speeds, was potentially very dangerous. Early trains were constructed mainly of wood – consequently derailments and collisions often resulted in dreadful loss of life as rolling stock disintegrated and often caught fire. Reducing the number of such accidents relied to a large extent on compliance with rules and regulations and a type of railway discipline akin to that in the military. Each railway

company had its own Rule Book and most introduced checking systems to ensure that its employees were complying.

I would argue that these embryonic safety management systems were an effective tool that helped railway companies, to manage risk in the railway industry. A second driver of change was technology. New technologies enabled railways to prove the routes were set for the safe passage of trains, keep trains separated from each other and ensured the automatic application of brakes should trains become divided.

So that brings us to the modern era. In the final decades of the twentieth century British Rail, and later the privatised railway companies continued to operate safety management systems and investigate incidents and accidents. Overseeing all of this was Her Majesty's Railway Inspectorate, HMRI. Since 1919, the railway inspectorate had been part of the Ministry of Transport and had two basic functions, the inspection and approval of new and modified railway works and the investigation of railway accidents using powers provided by the Regulation of Railways Act 1871. In 1990, HMRI was transferred to the Health and Safety Executive and acquired the additional responsibility for monitoring the workplace health and safety of railway employees.

On 2 April 2006 the HMRI was merged with the Office of Rail Regulation (now the Office of Rail and Road).

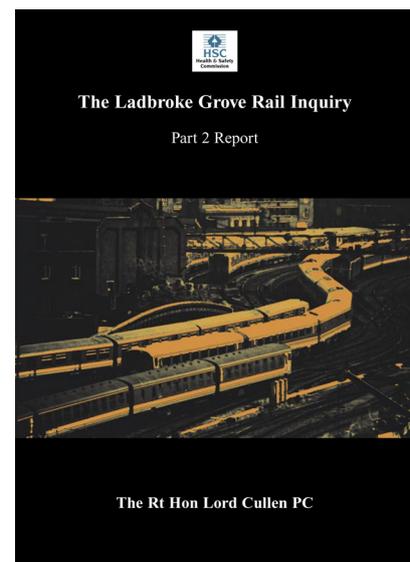
### **Ladbroke Grove**

At six minutes past eight on 5 October 1999, a passenger train enroute to Bedwyn in Wiltshire left platform 9 at Paddington Station. About three minutes later there was a collision at Ladbroke Grove Junction between this train and a First Great Western train from Cheltenham to Paddington. The closing speed of the two trains was 130 miles per hour and the consequences were truly dreadful. 31 people lost their lives and 417 people were hurt, many with life changing injuries.

The accident sent shock waves throughout the railway industry and government. A Public Inquiry was set up, chaired by Lord Cullen, a Scottish High Court judge who had chaired the Public Inquiry into the Piper Alpha oil rig disaster. The findings and recommendations of the inquiry were presented in a report with two parts. The second part considered the general experience derived from relevant accidents on the railway, with a view to drawing conclusions about factors which affect safety management and the appropriateness of the regulatory regime.

Chapter 11 of the part two report considered the adequacy of the arrangements for the investigation of railway accidents. At this point I shall quote directly from Lord Cullen's report:

*I consider that the stronger argument is in favour of the responsibility being entrusted to an independent body set up for the purpose, a Railway Accident Investigation Branch (RAIB), which would be similar in constitution to the Air Accidents Investigation Branch (AAIB) and the Marine Accident Investigation Branch (MAIB).*



**Figure 7:** The Ladbroke Grove Rail Inquiry Report

The mention of AAIB and MAIB is highly significant. These investigation bodies fulfilled the UK's international obligations to establish independent bodies with the legal powers needed to investigate complex transport accidents. There was an international consensus that independent safety investigation authorities, separate from regulatory bodies, were needed to maximise the potential for valuable safety learning following 'near-miss' incidents and accidents. In the case of the civil airline industry the principle of expert investigation can be traced back to the Convention on International Civil Aviation, signed at Chicago on 7 December 1944, an example of incredible international cooperation and foresight given that it was negotiated and agreed during a world war.

Lord Cullen's recommendation could not have been clearer:

*The investigation of rail accidents and incidents of whatever nature should be brought under the overall control of the RAIB*

The government accepted this recommendation and put in place the legislation needed to establish the RAIB and provide it with the powers it needed. The first Chief Inspector, Carolyn Griffiths, was appointed in May 2003 and immediately set about the challenging task of establishing a brand-new expert body capable of investigating railway accidents from day one. RAIB powers came into force in October 2005.

So, how is RAIB different from what came before? I think the answer to this question is fourfold:

**First** RAIB's only role is the investigation of railway accidents. This means it consists of 'super-specialists', full time railway accident investigators and RAIB gets plenty of practise at what it does (and plenty of feedback)

**Second** RAIB stands apart from the regulation of the railway. This puts it in the unique position of being able to investigate the railway industry and its safety regulation. This ability is vital since the railway is a large and complex sociotechnical system that encompasses private companies, state owned bodies and government agencies

**Third** RAIB is on-call 365 days a year and is equipped to go to accident sites to lead the safety investigation, gathering the evidence and interviewing those directly involved

**Fourth** and most importantly:

RAIB's role is clearly defined and strictly limited to safety improvements. Since RAIB does not apportion blame or liability, it is ideally placed to win the trust of those it investigates, at whatever level of an organisation. This engenders openness and a willingness to work with RAIB that is of enormous value to railway safety.

So, how does the RAIB address the task of investigating railway accidents? There is no shortage of academic papers about accident causation which range from insightful to indecipherable. Taken as a whole, these provided a theoretical basis for the branch's causal analysis. However, very few, if any, of these papers say very much about the practicalities of investigation. To develop this understanding RAIB looked to others, police services, HMRI and HSE; and then developed its own methodology suitable for the purpose of railway safety investigation. This was based on six key principles:

- safety learning needs to be underpinned by sound evidence
- evidence needs to form the bedrock of sound causal analysis based on a proper understanding of cause and effect

- areas of uncertainty need to be clearly identified and explained
- safety learning needs to be linked to the evidence and sound analysis
- the results of investigations should be made available to industry, the general public and government
- those involved or affected by accidents, including bereaved families, should be kept informed of investigations, and given the opportunity to comment on the findings and recommendations

The process that emerged has a number of distinct phases

- the first is the response to notifications and deploying inspectors to accident sites to conduct preliminary examinations
- the second, the collection of evidence (on site, electronic data, documentation and witness interviews)
- the third is the analysis of that evidence (typically multi-lane timelines and a variant of why-because causal analysis)
- the fourth is documenting the evidence, analysis, findings and conclusions in a report
- and the final stage is the formulation of recommendations that will make a real difference to railway safety in the future.

The application of this methodology is dependent on a team of trained professionals, most with a railway background, and a process of periodic checking, peer review and challenge. Each investigation is also the subject of informal and formal consultation with the railway industry. So, an RAIB report and its recommendations are not the output of a single investigator working in splendid isolation but the product of a team. Each RAIB investigation has therefore been subject to review and challenge from within and from outside the branch.

I am often asked to describe the difference that RAIB has made to railway safety. Of course, I do not own a 'counterfactual machine' that allows me to measure railway safety in an alternative universe without RAIB. However, I can point to many hundreds of RAIB recommendations focused on the improvement of railway safety. Of course, recommendations are just that, they do not mandate the actions which should be taken. Nevertheless, the vast majority of recommendations have been implemented by the railway industry, leading to substantive actions to improve safety. I would observe that RAIB does not drive the railway industry to implement improvements, but rather, encourages it to travel in the right direction. Examples of RAIB's influence can be found across every part of the railway industry (encompassing the national main line networks in Great Britain and Northern Ireland, metros, tramways and heritage railways) and every technical discipline.

Impactful recommendations made by the RAIB have included improvements to the design of points and the conspicuity of wig-wag lights at level crossings. It has also encouraged the implementation of automatic braking systems for trams that overspeed at critical locations, an accelerated programme for the installation of tactile strips on platform edges to protect visually impaired passengers and the improved management of fatigue across all sectors of the industry.

Every bit as importantly, RAIB has also made numerous recommendations to address issues that relate to safety management and organisational culture. Two particular themes recur on a regular basis as factors underlying the causation of accidents. The first is corporate risk awareness and the second is management assurance. Since I believe these to be key issues influencing railway safety, I propose now to address each in turn, starting with risk awareness.

## Risk awareness

In my experience as an accident investigator, managers at every level of the railway industry generally appreciate the importance of understanding the way in which their organisations deliver safety. However, given the complexity of the railway's systems, it is often very difficult for those at the heart of an organisation to clearly picture how their safety defences interact and their areas of weakness.

One way to conceptualise threat/risk awareness is by adapting the Johari window and the concept of knowns and unknowns popularised by the former US Secretary of Defense, Donald Rumsfeld.

Every organisation will have a range of threat and risks that it believes it understands reasonably well because the threats (i.e. the hazards) are obvious and the associated risk data well understood. For these 'known knowns' the challenge is to ensure that the organisation's understanding of the risk remains valid as circumstances change. For other threats the risk may be less well understood in which case the challenge is to understand better the threat and/or the associated risk.

That leaves us with the infamous 'unknown unknowns' – these are threats that an organisation is unaware of, and the consequent lack of any appreciation that there is a risk that needs to be managed.

So, how does an organisation take account of the unknown unknowns – how do you detect something that's hidden from you? The simple answer is that industry leaders and their teams need to open their corporate mind and look beyond the obvious. They need to look for clues and weak signals that something is awry. This could be a slight inconsistency in the data, an unexplained malfunction or something said in an everyday conversation, or something noticed when out and about on the network.

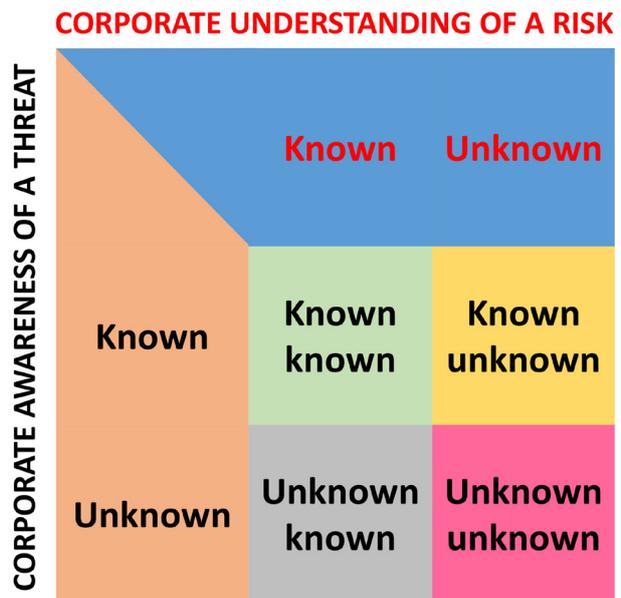
RAIB's investigations have identified a number of reasons why threats to safety remain hidden from leaders in railway organisations. These include:

### *Inadequate data*

The railway industry is very good at collecting data on things that have already happened (that is lagging indicators). It is much less good at collecting data that reveals how well its management systems are functioning and the extent to which they are effective in controlling risk (so called leading indicators).

### *Poor reporting*

All railway organisations have processes to enable staff to report safety issues. The effectiveness of these is highly dependent on the safety culture of the organisation. The real measure of the effectiveness of any reporting system is the extent to which people feel that it is safe to report their own errors.



**Figure 8:** The Johari window and the concept of knowns and unknowns

### ***Lack of requisite imagination***

'Requisite imagination' has been described as the 'fine art of anticipating what might go wrong'. Risk managers at any level of an organisation need to apply requisite imagination if they are to recognise threats not revealed by their historical data, and which is outside of their immediate experience.

### ***Poor intelligence***

Corporate entities are reliant on good intelligence if they are to be sufficiently aware of threats to safety. Intelligence relies on both formal information flows through the organisation and a myriad of informal personal exchanges at every level. These flows of information, which are so vital to safety assurance, are easily interrupted by poor working relationships, dysfunctional management structures or mutual distrust.

### ***Lack of transparency***

In order for an organisation to be aware of the threats to safety it needs access to information. It needs to understand the design of its equipment, how it might fail, and the consequences should this happen. Barriers to accessing safety related information can include commercial confidentiality, poor retention of documents or the lack of expertise needed to interpret technical data.

To achieve a high level of safety, leaders need to maintain a state of constant wariness concerning the management of risk, a condition often described as 'chronic unease'. Despite sounding like a nasty medical condition, 'chronic unease' describes a state of unrelenting watchfulness, a persistent suspicion that all is not well, that something could go horribly wrong at any moment. Such a mindset is of very real value in an industry such as railways, where safety is reliant on a myriad of safety controls that interact in a complex manner. In a study sponsored by Royal Dutch Shell, researchers Dr Fruhen and Prof. Flinn interviewed senior managers in the oil and gas industry and identified four characteristics or habits of mind underpinning chronic unease: 'safety imagination'; vigilance; pessimism and a tendency to worry.

Those with a strong 'safety imagination' are able to imagine the catastrophic consequences of precursor events (i.e., low frequency, high consequence accidents). Those with vigilance tend to closely monitor the environment, picking up on even weak signals of a problem. Pessimism and worry are linked to a tendency to expect failure, and tenacity in pursuit of improved safeguards.

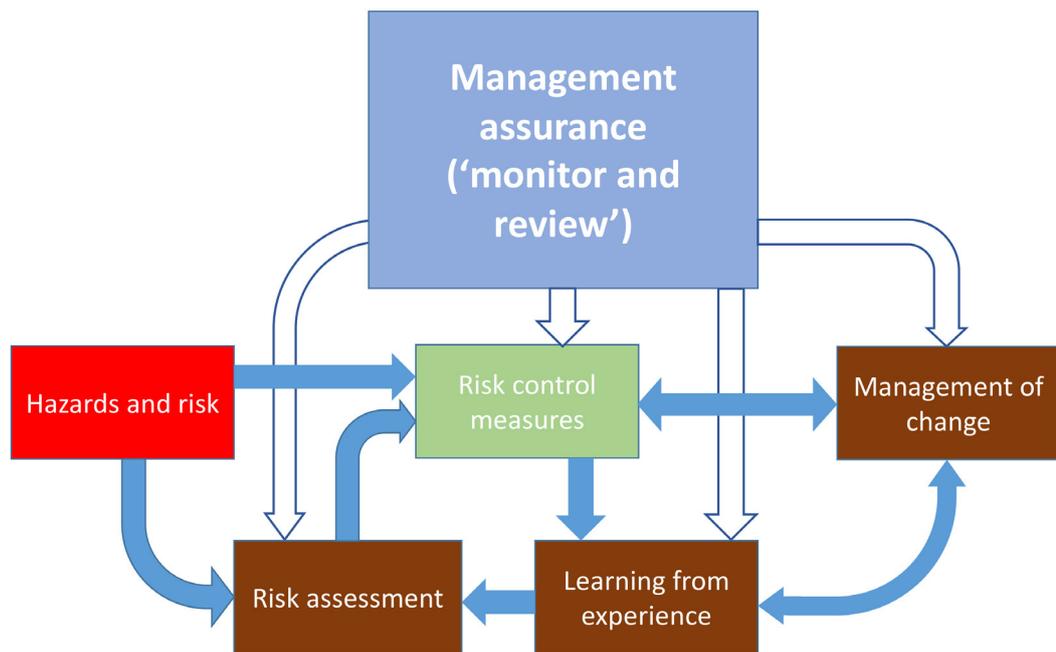
RAIB investigations have highlighted the need for railway leaders and their teams to understand the threats to the safety of their business and the consequential risk. For this reason, RAIB has consistently urged organisations to take the time to think hard about the way that they are assuring themselves that the threats to the safety of the railway have been identified and the associated risk understood. This is often expressed in the form of a recommendation to review a threat that was highlighted by an investigation and to identify the scope for additional mitigation measures commensurate with the risk.

By way of example, the RAIB's investigation of the overturning of a tram at Sandilands junction in November 2016, that led to the tragic death of seven passengers, identified that the risk associated with excessive speed around curves was neither fully understood nor adequately addressed by UK tramways or the safety regulator. Consequently, RAIB recommended that the entire tramway sector work together to gather safety data and carry out a detailed assessment of the risks associated with the operation of UK tramway systems, particularly those operating on segregated tracks. This work was overseen by a newly created body established in response to an RAIB recommendation, the Light Rail Safety and Standards Board.

Having sought to understand the threats and risks, how should safety leaders assure themselves that their safety risks are being effectively managed in the way that they imagine? This process of management assurance, so fundamental to the management of railway safety, is often identified as a factor in RAIB's investigations.

## Management assurance

All railway organisations are required by UK legislation to implement a 'safety management system' (SMS) to control its risks. In essence, an SMS is required to identify the control measures that have been established to manage the risk associated with the known threats to safety. By means of risk assessment, organisations can satisfy themselves that its risks are being managed so far as is reasonably practicable.



**Figure 9:** Overview of a railway Safety Management System (SMS)

Management assurance is the control mechanism that monitors and reviews the health and robustness of the SMS. It is therefore critical to the safe operation of any railway organisation and should be a key focus for railway safety leaders. It provides assurance that safety defences are functioning as intended and enables leaders to address areas of weakness. Good management assurance is about an organisation's leaders and managers being aware of any gaps between theory and practice, and then taking action to address them.

An underlying theme in many of RAIB's investigations has been the divergence between what the management system said should be happening, and what was actually going on. By way of example, RAIB's investigation into the accident at Margam that resulted in the death of two track workers identified that Network Rail's management assurance system was not effective in identifying the full extent of procedural non-compliance and unsafe working practices, and so did not trigger the management actions needed to address them. Similar issues with management assurance were also identified in the investigations into the death of a train driver at Tyseley depot, the fatal accident involving a track worker at Roade in April 2020 and, much more recently, the tragic derailment at Carmont that led to the death of three people.

Certainly, good management assurance relies on formal systems such as audits and management reviews. However, RAIB investigations are revealing that a positive, open and

honest culture is also needed if leaders are to be properly informed and protected from wishful thinking and over-optimistic reporting.

Railway accident investigations over many years have highlighted the need for industry leaders and their teams to constantly strive to better understand the risk to the safe operation of their business and the areas of weakness in their safety management systems. Taken together these two elements; risk awareness and management assurance; are important components of organisational safety culture .

## **Organisational safety culture**

So, what does organisational safety culture mean, can it be described and measured in a way that is meaningful to railway industry leaders? It is my view, based on years of RAIB investigations, that any review of organisational safety culture needs to answer the following fundamental, and sometimes uncomfortable, questions:

***Do leaders and their teams regularly review and robustly challenge the adequacy of their safety systems?***

Or are they a little too ready to receive positive news and plug it into a comfortable model of how well their organisation is managing safety?

***Do leaders and their teams have the 'requisite imagination' to assess safety threats beyond their experience?***

Or are they bound by the limits of their experience and data?

***Do leaders and their teams actively seek measures of how well their safety systems are working in the real world?***

Or do they continue to rely on lagging data which tells them everything about what has gone wrong, but very little about why?

***Are leaders and their teams able to select and analyse the information they need to properly understand their safety performance?***

Or are they drowning in a sea of data?

***Do leaders and their teams really understand why their people deviate from laid down processes?***

Or are they simply cataloguing non-compliances with bad process?

***Do leaders and their teams have an open, honest and just culture that encourages the flow of information up, down and across their organisation?***

Or is it just good news that flows freely?

***Are safety processes properly understood and embedded with those who must make them work?***

Or are 'things done differently away from head office'?

***How well does an organisation learn from previous experience, and then use it to improve its safety arrangements?***

Or is it slow to learn and reluctant to change?

***Do leaders and their teams spend time out and about, watching how things are done and listening to their people?***

Or are they trapped in a senior management 'echo' chamber?

***Is there any evidence that people in the organisation feel able to report safety concerns – and does this extend to reporting their own errors?***

Or is there a general reluctance to report due to a real or perceived blame culture?

The answers to these 'difficult' questions will provide a very real insight into an organisation's safety culture. I therefore contend that it is better that railway industry leaders and their teams ask themselves such questions as a matter of routine rather than waiting for the RAIB inspector to call after an accident has taken place.

## Emerging threats and challenges

Before concluding I would like to highlight what I see as some of the emerging threats and challenges to the safety of the railway in the years to come.

In my time at RAIB I saw massive changes in the railway industry. Change is good because it is nearly always an opportunity to get better at what you are doing. But it also brings new threats and challenges that need to be addressed. So, I will conclude by outlining some of the emerging issues that I believe need to be addressed in the years to come. Rather than listing the threats, I thought it better to talk in terms of objectives – what is it that we should be seeking to achieve in relation to each of the areas of threat:

- a proportionate and safe response to extreme weather events, such as intense rainfall (an issue highlighted by the recent fatal derailment at Carmont)
- establishing a strategy that recognises that the safety of disabled passengers is an inherent part of delivering greater accessibility
- designing safety critical high integrity computer-based systems that work as intended – and spotting the flaws before they have real-world consequences
- safely managing the transition from human control to greater automation, based on a sound appreciation of how people interact with machines
- a safety culture based on mutual respect in a diverse workforce – moving on from the pseudo-military approach of the past to something more appropriate for today's attitudes and breaking through the cultural barriers to safe behaviours
- keeping the focus on the day job at a time of massive organisational change
- developing the profession of railway operator – keeping the best people on the 'front-line' of the railway

## Conclusions

How can I best summarise what I have learned over the last 18 years as a full-time railway accident investigator?

The risk from train accidents is much lower than it was when I joined the industry in 1982. Remarkably, there was not one person killed in a train derailment or collision on the UK's mainline network, or on a metro system, between March 2007 and July 2020. However, the safety record of the UK's tramway sector was marred by the tragic accident at Sandilands junction in 2016 that led to the death of seven passengers.

The improvement to mainline railway safety is linked to a range of factors including the corporate motivation to minimise harm to people and financial losses, government intervention and learning from experience. It is also important to recognise that a combination of technology, sound engineering and modern safety management systems have delivered a great deal in terms of improved railway safety over many decades.

Furthermore, railway accidents in the UK have for many years been the subject of an independent investigation – this has meant that railway safety systems have always been open to review and challenge by external investigators. Investigations shine searchlights into the darkest corners of safety management and evidence of weaknesses are exposed to



**Figure 10:** The RAIB arrive at the site of a serious railway accident

the public. Although this can be uncomfortable for the people and organisations involved, these independent investigations ensure that safety learning is identified and translated into positive measures for improvement.

The investigation of railway accidents often involves a detailed consideration of technical issues and management systems. However, if the potential for learning is to be maximised, investigators need also to consider the underlying factors that have made possible the conditions that led to an accident. Examples of such factors include the awareness of risk within organisations, management assurance and an organisation's safety culture.

Investigation of railway accidents is able to identify weaknesses in existing safety defences and highlight emerging threats to the safe operation of the railway. However, for safety investigations to make a real difference they need to be focused on learning rather than blame, they need to be independent from those under investigation, conducted by competent investigators and based on evidence rather than opinion. Findings need to be well communicated in readable reports with clear safety recommendations that can be traced back to the evidence.

I believe that independent safety investigation is a powerful tool for the continued improvement of safety in the transport sector. I hope to see the concept and many of the working methods the Accident Investigation Branches have established spreading to other sectors. A Health Service Safety Investigations Body (HSSIB) is about to be established as a statutory body, independent of the NHS and at arm's length from the government; and the Ministry of Defence has already established an accident investigation branch.

For me, the obvious next frontier must be the establishment of an independent body for the expert safety investigation of road accidents. The potential for saving death and injury in the road sector is truly vast and I am pleased to see movement in that direction.

# Previous Westminster Lectures on Transport Safety

The Westminster Lecture is an annual event in which leaders in transport safety address topics of concern to practitioners, researchers, and policymakers in the field. It is organised by PACTS.

- 29<sup>th</sup>** Robert L. Sumwalt, FRAeS, Chairman, US National Transport Safety Board  
*Lessons from the Ashes: Improving Transportation Safety through Accident Investigation*
- 28<sup>th</sup>** Prof. Alan F. T. Winfield, Bristol Robotics Laboratory, UWE Bristol  
*The Implications of Robots in the Transport Sector*
- 27<sup>th</sup>** Christian Friis Bach, Executive Secretary & Under-Secretary-General, United Nations Economic Commission for Europe  
*Road Safety and the Global Goals for Sustainable Development*
- 26<sup>th</sup>** Ruth Sutherland, Chief Executive, Samaritans  
*Working Together to Reduce Suicide in Transport*
- 25<sup>th</sup>** Tony Bliss, Global Road Safety Advisor, Monash University Accident and Research Centre, Australia  
*Road Safety in the 21st Century: Public Expectations of Government*
- 24<sup>th</sup>** Dr Rob Hunter, Head of Flight Safety, BALPA  
*Staying Awake, Staying Alive: The problem of fatigue in the transport sector*
- 23<sup>rd</sup>** Jeanne Breen, OBE, FRSA, MCIHT, Jeanne Breen Consulting  
*Managing for Ambitious Road Safety Results*
- 22<sup>nd</sup>** Dr Jillian Anable, Centre for Transport Research, University of Aberdeen  
*More haste, less speed: changing behaviour for safety and sustainability*
- 21<sup>st</sup>** Danny Dorling, Professor of Human Geography, University of Sheffield  
*Roads, casualties and public health: the open sewers of the 21st century?*
- 20<sup>th</sup>** Fred Wegman, Managing Director, SWOV Institute for Road Safety Research, The Netherlands  
*Putting People at the Centre: How to Improve Road Safety in the 21st Century*
- 19<sup>th</sup>** Professor Oliver Carsten, University of Leeds  
*Technology: Curse or Cure?*
- 18<sup>th</sup>** Professor James Reason CBE, Emeritus Professor, University of Manchester  
*Recurrent patterns in transport accidents: Conditions and causes*
- 17<sup>th</sup>** Professor Phil Goodwin, Professor of Transport Policy at the Centre for Transport and Society, UWE Bristol, Emeritus Professor at University College London  
*Determination and Denial: The Paradox of Safety Research and Traffic Policy*
- 16<sup>th</sup>** Professor Ronan Lyons, Professor for Public Health, University of Wales at Swansea  
*Connecting Public Health and Transport Safety*
- 15<sup>th</sup>** Professor Helen Muir, Director, Cranfield Institute for Safety, Risk and Reliability  
*In times of crisis how do passengers react?*
- 14<sup>th</sup>** Professor David Begg, Chairman, Commission for Integrated Transport  
*Transport Safety and Integration: putting the two together*

- 13<sup>th</sup>** Mr Ken Smart, CBE, Chief Inspector, Air Accidents Investigation Branch  
*Transport Accident Investigations: a question of trust*
- 12<sup>th</sup>** Professor Richard Allsop, Centre for Transport Studies, UCL  
*Road Safety: Britain in Europe*
- 11<sup>th</sup>** Dr Rod Kimber, Director of Science and Engineering, TRL  
*2010: Getting there in one piece*
- 10<sup>th</sup>** Simon Folkard D.SC, Department of Psychology, University of Wales at Swansea  
*Transport: Rhythm and Blues*
- 9<sup>th</sup>** Dr Dianne Parker, University of Manchester  
*The social psychology of driver behaviour: is it time to put our foot down?*
- 8<sup>th</sup>** Professor Frank McKenna, Department of Psychology, Reading University  
*Death by Accident: the psychology of human error*
- 7<sup>th</sup>** Mr Stefan Nillson, Director, Automotive Safety Centre, Volvo  
*A Holistic View on Automotive Safety*
- 6<sup>th</sup>** Sir Alastair Morton, Co-chairman, Eurotunnel  
*There is no such thing as perfect safety in transport, but life is life, however you travel*
- 5<sup>th</sup>** Dr Leonard Evans, Principal Research Scientist, GM R&D Centre  
*Traffic Safety Measures, Driver Behaviour Responses and Surprising Outcomes*
- 4<sup>th</sup>** Mr Brian O'Neil, President, Insurance Institute for Highway Safety  
*Progress in Transport Safety: the US experience*
- 3<sup>th</sup>** Mr Robert Coleman, Director General, DG VII, European Commission  
*Transport Safety and the EC*
- 2<sup>th</sup>** Dr Ian Johnston, Executive Director, Australian Road Research Board  
*Effective strategies for transport safety: an Australian's perspective*
- 1<sup>st</sup>** Dr Jan C. Tetlow, Secretary General, European Conference of Ministers of Transport  
*Transport Safety: European cooperation for the 90's*

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The 30<sup>th</sup> Westminster Lecture on Transport Safety was held in partnership with the RAC Foundation and supported by Burges Salmon LLP



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ISSN 1740-0368

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