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Theme: System Design: Keep Railway Developments on the Right Track

Topic: Challenges in sustaining rail safety: learning lessons from others

Abstract: *Rail safety regulators and other official bodies will tell you that, as a rail organisation, it is your duty to try to learn from the mistakes and incidents of others, not just in the rail industry and not just in your country but in international rail incidents and from incidents occurring in other industry sectors. This was **very** forcefully driven home during the Royal Commission into the Waterfall incident that occurred on 31 January 2003 in Sydney, Australia (7 fatalities) – already long forgotten outside of New South Wales in Australia I suspect. How do we do that? How do we find the time for this?*

This Paper will show a simple way to quickly monitor and follow up on major incidents

from elsewhere and explain how the fundamentals of an incident are often universal and not industry sector specific. Using a topical case study we shall show how you can use the results to assess your own system.

The aim is obviously to avoid having major incidents by understanding and adopting the lessons learned from others' misfortune and enhancing our own system. There is, however, a problem here - not all incident investigations end up in the public domain. Even in Australia this is the case, and we, as a safety community need to fight that.

Completely open and honest investigations into serious incidents are not necessarily the norm. Even in the EU very few member States make serious incident investigation reports available in the public domain. The obvious exception is the UK. Likewise in Australia our esteemed colleagues in the Australian Transport Safety Bureau (ATSB) lead the way in this respect.

As a case study in point the paper will consider the serious incident involving a British Airways B777 aircraft suffering power failure and subsequent very heavy landing on approach to Heathrow Airport, 17th January 2008 (no deaths but the aircraft was written off), based on the investigation report by the UK Air Accidents Investigation Branch Report, which is freely available on the internet.

http://www.aaib.gov.uk/cms_resources.cfm?file=/1-2010%20G-YMMM.pdf

Is this a waste of time? You tell me – as the old adage goes, there are no new incidents in rail safety, we just keep having the same old ones, with new people injured and killed. Corporate memory is short and often leaves when key people retire or move on. A secondary issue for the conference is how do we, as a safety community, encourage the 'powers that be' to make investigation reports available in the public domain?

*I give as an example a fatal incident that occurred in the Hunter Valley, New South Wales in March 2009 where a new turnout was being lifted into place. The investigation report into this incident is not likely to end up in the public domain and will have a punitive rather than a just culture approach. We could **all** learn from this incident, but it is not going to be available. Is that right?*

Learn from the mistakes of others, because you will not live long enough to make them all yourself.

Jerome F Lederer, Founder, Flight Safety Foundation

Introduction

The concept of learning from other people's mistakes, errors and misfortune is not new, but we ignore it at our peril. Jerry Lederer was a pioneer in aviation safety where he was known by the sobriquet 'Mr Aviation Safety' and had a distinguished career. In 1927 he inspected the *Spirit of St Louis* before Charles Lindbergh's epic trans-Atlantic flight. He said at the time ' he did not have too much hope he would make it'.

I also recall during my time working with the Special Commission of Inquiry into the Waterfall accident, the Commissioner, Justice Peter Aloysius McInerney forcibly berating

senior managers from RailCorp because they had no knowledge of rail accidents that had occurred elsewhere. He regarded it as part of their duty to be aware of such things and to try to learn and avoid the mistakes of those other incidents. Most of those challenged claimed they did not have time to do that.

You can obviously also learn from the **success** of others, seeking perhaps that elusive quarry 'best practice'. Arguably one of the most successful business people in recent times was Jack Welch, the CEO of General Electric from 1981 to 2000. During that time he increased the market capitalization of GE from US$13 billion to US$500 billion and many of his values had a direct and positive impact on safety. He developed a systemic approach to what he did, that was encapsulated in 25 lessons learned, which I think are always worth a second look. I have underlined those that can or do have a direct impact upon safety:

- **Lead** – managers muddle, leaders inspire
- **Manage less** is managing better
- **Articulate your vision** that will inspire others to act
- **Simplify** - simple messages travel faster, eliminate clutter - faster decisions
- **Get less formal** – so that staff will challenge ideas
- **Energise others** – to spark them into extraordinary performance
- **Face reality** – saying and doing things that may not be popular
- **See change as an opportunity** – willingness to change is a strength
- **Get good ideas from everywhere** – new ideas are lifeblood of business
- **Follow up** – a key measure of success
- **Get rid of bureaucracy** – remove layers, shackles and functional barriers
- **Eliminate boundaries** – 'boundarylessness', no silos – free flow of ideas
- **Put values first** – do not focus too much on numbers
- **Cultivate leaders** – people who have the 4 E's
- **Create a learning culture** – continuously learn from any source,anywhere
- **Involve everyone**- capture intellect from everyone – more freedom
- **Make everybody a team player** – middle managers - team members & coaches
- **Stretch** – set stretch goals that will really challenge people
- **Instill confidence** – confidence – a vital ingredient of a learning organisation
- **Make business fun** – a big element in business strategy – enjoy your job
- **Be number 1 or number 2** – be in control of your destiny
- **Live quality** – take it to a whole new level
- **Constantly focus on innovation** – shun incremental. Look for the quantum leap
- **Live speed** – incorporate it into the fabric of the organisation
- **Behave like a small company** – uncluttered, simple, informal, ridicule bureaucracy

More information on this is to be found at:

http://www.1000ventures.com/business_guide/crosscuttings/tests_leadership_ef_byge.html

The paper was originally going to look at the British Airways B777 aircraft incident at Heathrow in January 2008, but events move on and for various reasons I would like to look at another couple on accidents and see what we can learn from them. The

first is the crash of a Royal Air Force Nimrod aircraft in Afghanistan in 2006, with the loss of 14 lives, and the second is the much more recent and still topical loss of the Deepwater Horizon drilling rig with the loss of 11 lives and a major oil spill. The Nimrod event was subject to a major investigation and the results are freely available. The Deepwater Horizon is still subject to various investigations, but enough information is available to make an accurate assessment of what there may be to learn from this accident.

Here I would like to make a plea on behalf of all those who seek to learn from other people's accidents. Not all accident reports, by any means, are made public. Whilst it is accepted that in some (a few) cases this will happen, I believe that some version (perhaps sanitized) should always be made public. Even in Australia we suffer from this problem. Apart from our good friends in the Australian Transport Safety Bureau, the release of reports is often left to the 'discretion' of a government minister, or in the case of accidents investigated by OH&S Regulators, simply never sees the light of day.

One example of this latter problem concerns a fatal accident that occurred in the Hunter Valley in New South Wales in March 2009. You cannot learn lessons when you do not have the facts because the investigation remains secret.

We learn from history that we don't learn from history

— Hegel

Nimrod XV230 loss in Afghanistan

I should explain in talking about this military aviation accident that I was a pilot in the Royal Air Force in a previous life.

You may say 'what is the relevance of a military air crash in a remote part of Afghanistan to do with the rail industry?' A reasonable question that I shall hopefully be able to answer.

The official investigation report (almost 600 pages) into the Nimrod crash can be found here:

http://www.mod.uk/defenceinternet/aboutdefence/corporatepublications/boardsofinquiry/boinimrodmr2xv230.htm

The investigation was headed by Charles Haddon-Cave QC, with the sub-title *A Failure of Leadership, Culture and Priorities* and is dedicated to the 14 military personnel who lost their lives 'in the hope and expectation that lessons will be learned from their sacrifice'. Previous to the issue of the Haddon-Cave report a coronial enquiry reached the conclusion that the aircraft, and others like it, had '**never been airworthy from the first time it was released into service nearly 40 years ago'**. The aircraft suffered from fatal design flaws (sometimes called *a latent pathogen*), but it is the failure to pick this up that is the lesson to be learned.

There had also been previous incidents of a similar nature that did not result in the loss of an aircraft but should have been taken more seriously as 'wake-up calls' – alarm bells that we all ignore at our peril. The design flaws actually came in three stages. First with the original design of the fuel system, secondly with the addition of a 'Supplementary Conditioning Pack' and finally with the fitting of air-to-air refueling equipment.

It is asking a lot for someone in the rail industry to read a 600-page report about an aviation accident. The key to making use of such documents lies in a careful read of the Executive Summary. Interestingly, the report comments 'many of the lessons to be learned are not new'. Here it is immediately clear that the Royal Air Force had serious organisational culture issues around safety management. Other key shortcomings identified include:

1. Failure to adhere to basic principles
2. Safety Case regime which is ineffective and wasteful
3. Weaknesses in personnel
4. A Safety Culture that allowed 'business' to eclipse airworthiness

I would like to focus on the second item. Although Safety Cases are used in the rail industry mainly in the UK, if we simply imagine a Safety Case as equivalent to a Rail Safety Management System, there are obvious lessons to be learned. The Nimrod Safety Case was 'fatally undermined by a general malaise, a widespread assumption by those involved that Nimrod was 'safe anyway (because it had successfully flown for 30 years) and the task of drawing up the Safety Case became essentially a paperwork and tick-box exercise'. This must sound familiar to any of us who have anything to do with Safety Management Systems.

Reports like this always have an Executive Summary. This one is quite detailed but it highlights the immediate physical causes of the accident, the problems with the Safety Case, the organisational issues and the recommendations. It would take typically 5-10 minutes to read this Executive Summary and identify those issues that may have some relevance to your organisation.

The fundamental messages that you can pick up in such reports are usually completely transferable. What that means is that even though it is a different industry and it is in a different country, there is often a great deal of commonality.

Incidentally this report, following the philosophy I am pushing here, does have a Section on lessons learned from elsewhere, covering incidents such as the loss of the *Columbia* Space Shuttle (2003, with many close parallels); Kings Cross fire (1987); Zeebrugge ferry disaster (1987) and BP Texas City (2005). It also considers accident theory and high-risk technologies that is worth a look as well as developing some new principles to help assure and ensure an effective safety regime.

In terms of lessons to be learned the first place to start is within the organisation. If you do not learn from your own lessons then you are unlikely to learn from the lessons of others. The Nimrod loss was preceded by **a number of similar incidents that should have acted as warnings.** 5 out of the 7 listed in the report concerned incidents involving Nimrod aircraft. These incidents represented missed opportunities to spot risk, patterns and potential problems and for action on these

matters. Mostly they were treated as 'one-off' incidents with little thought being given to potential systemic issues. There was also a lack of 'corporate memory'- these incidents where the consequences were less severe or minor were soon forgotten. They should have been dealt with as very loud warning bells.

Finally back to the Safety Case. A Safety Case, if prepared with due diligence, represents a powerful tool in the identification and management of hazards. Again, if you only have time to read the summary that should be a rewarding experience (the whole chapter is nearly 80 pages long) and hopefully you will have time to read through the details of all aspects that are relevant to you and your organisation.

Towards the end of his report Charles Haddon-Cave has a section on safety culture. We hear a lot about safety culture, what the ideal safety culture should be all about. He refers to James Reason's 'engaged' safety culture, as adopted recently by NASA. He cites five elements needed to build an engaged organisation and safety culture:

1. **A reporting culture**: an organizational climate where people readily report problems, errors and near misses.

2. **A just culture**: an atmosphere of trust where people are encouraged and even rewarded for providing safety-related information; and it is clear to everyone what is acceptable and unacceptable behaviour.

3. **A flexible culture**: a culture that can adapt to changing circumstances and demands while maintaining its focus on safety.

4. **A learning culture**: the willingness and competence to draw the right conclusions from its safety information and the will to implement major safety reforms.

5. **A questioning culture**: it is vital to ask '***What if?***' and '***Why?***' questions. Questions are the antidote to assumptions and the will to implement major safety reforms.

A company that has a compliance culture does not have a safe culture

Ian Wherwell, HSE

Deepwater Horizon loss – BP Blow Out, Gulf of Mexico

I should explain that in talking about this incident I worked in the offshore oil and gas industry for 17 years, including exploration drilling such as was happening here.

There is not yet an official investigation report into this accident – there may not be for some time, but there is enough known to reach some basic conclusions from which we can try to learn. Essentially shortcuts were taken and BP did not follow their own established practices to manage the risks. Even if they had followed their own established practices it would seem that these practices were somewhat short of what is considered best practice in the offshore oil and gas industry.

What exists, in an official capacity at the time of writing this Paper, are the

transcripts of an initial House of Representatives Inquiry (about 200 pages). The actual investigation is a joint investigation between the US Coastgaurd and the US Department of the Interior. The official website for this investigation is as follows:

http://www.deepwaterinvestigation.com/go/site/3043/

Avoiding the detailed technical complexities associated with the drilling of deepwater offshore oil and gas wells the House of Representatives Inquiry focused on four principle areas, the fourth of which was the response, which I shall ignore here. I shall focus on the 3 areas that led up to and including the blowout:

1. Well integrity

2. What happened on the rig in the time immediately leading up to the 'blow-out'.

3. The blow out preventer – a supposedly 'fail-safe' device intended to prevent exactly what happened. Fail-safe is a term used in the rail industry, mainly in relation to vital signaling equipment, but if signal equipment fails it generally leads to a degraded mode of operation that is less safe. So much for fail-safe.

   The BOP had been modified in a number of ways that did not seem to have been included in the drawings that BP used to try to operate it from an underwater panel.

   It was discovered that the shear rams in the BOP, designed to shear through the drill pipe and seal the well, were not powerful enough to shear through the drill pipe joints, which form 10% of the length of the drill pipe. Another separate document described 260 separate failure modes that would prevent the BOP from operating fully or at all.

   It was also customary practice that once the BOP was on the seabed its emergency systems are not tested any further.

BP had been involved in other recent major incidents, notably the 2005 Texas City Refinery explosion. The fallout from Texas City resulted in OSHA fines totaling US$100million. In 2006 a BP pipeline in Alaska ruptured due to inadequate maintenance and inspection

Those who cannot remember the past are condemned to repeat it

George Santayana

Sources of information

Specific sources of information are obviously extremely extensive and it makes sense to narrow the sources that you may choose to monitor for lessons learned information. Here are some suggestions:

http://www.atsb.gov.au/

The Australian Transport Safety Bureau we are probably all familiar with because they have been regular attendees to IRSC.

http://www.raib.gov.uk/home/index.cfm

The UK Rail Accident Investigation Branch lists completed rail incident investigation reports that can be downloaded and has a database of immediate and causal factors relating to rail incidents.

http://www.ntsb.gov/surface/railroad/railroad.htm

The railway section of the National Transport Safety Bureau has incident investigation reports available for download going back to 1991, with earlier reports listed going back to 1967. It also lists a number of studies that are available for download.

http://www.tsb.gc.ca/eng/medias-media/communiques/rail/2008/comm_r06t0022.asp

The Transport Safety Board of Canada has a similar listing of reports and studies.

http://www.rssb.co.uk/Pages/Main.aspx
The Rail Safety and Standards Board (UK) has an extensive range of information from which to learn, including research reports and a report on 'Learning from Operational Experience' and a Worldwide Accident Summary.

*If eternal vigilance is the price of liberty, then **chronic unease** is the price of safety*

— James Reason

Conclusions

Is this all a waste of time? Is looking at incidents that occur elsewhere, even within the rail industry, even within our own country, a waste of time. You must draw your own conclusions but I am a strong advocate for this as being good use of your time, so long as you develop techniques to be selective and then focus in on the key relevant detail, without having to read a whole 600-page report. It is obviously unreasonable for managers to be expected to undertake that, but it is not unreasonable for them to be suitably aware of incidents elsewhere and to make an attempt to pick up on any relevant lessons.

As we try to move our safety performance to a higher level it often helps to look at how others do it, especially those that do it better. There are organisations that operate in a higher risk environment than us and yet manage a better safety performance – **because they have to**. Examples include air traffic control, the nuclear industry and certain military environments. Their approach is typically characterised by the following criteria:

- Assume every day will be a dangerous day, always expect the worst, never relax your guard, maintain a state of chronic unease.

- Encourage system wide safety awareness for ALL members of the organisation. No one can be expected to help solve a system's safety problems if they do not understand what those problems are.
- Encourage and reward personal autonomy in the safety sphere but remember an empowered periphery must be aware of overall goals and approaches
- Encourage creative and critical thought for ALL members of the organisation. Although some will contribute disproportionately, it is vital to realise that some important ideas may come from unlikely sources.
- Link the parts of the system that are interdependent otherwise individuals will perform their contributions often in blissful ignorance of what the rest of the system requires.
- Scan the system's parts for relevant solutions or contributions. Use the best solutions regardless of their source.
- Reward communications and activities that show a desire to contribute to overall system safety. "Good try' is always better than 'no good'.
- Examine mistakes honestly, deal with them as system problems rather than person problems. The ability of the system to fix its problems is strongly related to a willingness to be open to criticism and correction.
- Create facilities for bypassing standard communication channels if these are 'blocked'. Encourage inquiry, critique and free flow of information. Legitimise reasoned and constructive dissent.
- Collect safety data so that it may be used in the future in unanticipated ways.

How do you think you rate against this list? Some of them may sound a bit strange but the fact is they WORK, so let's get a little 'reasoned and constructive dissent' going! Good luck.

*If everything seems to be going according to plan, you have **obviously** overlooked something*

— Roly Beaumont, Test Pilot

References

In addition to those given in the main text:

[1] Thomas, M.J.W. (2003) *Uncovering the origins of latent failures: the evaluation of an organisation's training systems design in relation to operational performance*, Proceedings of the 6th International Aviation Psychology Symposium