insight

NATIONAL HIGHWAYS
SPECIAL EDITION

ISSUE 18 2025

Driving Change,
SAVING LIVES

We Can't Do It Alone: The Urgent Call for Shared Road Safety Responsibility

MANAGING ROAD RISK
Building Safer Systems, Saving Lives

RETHINKING SAFETY
Why Fixing Systems, Not People, Drives Performance

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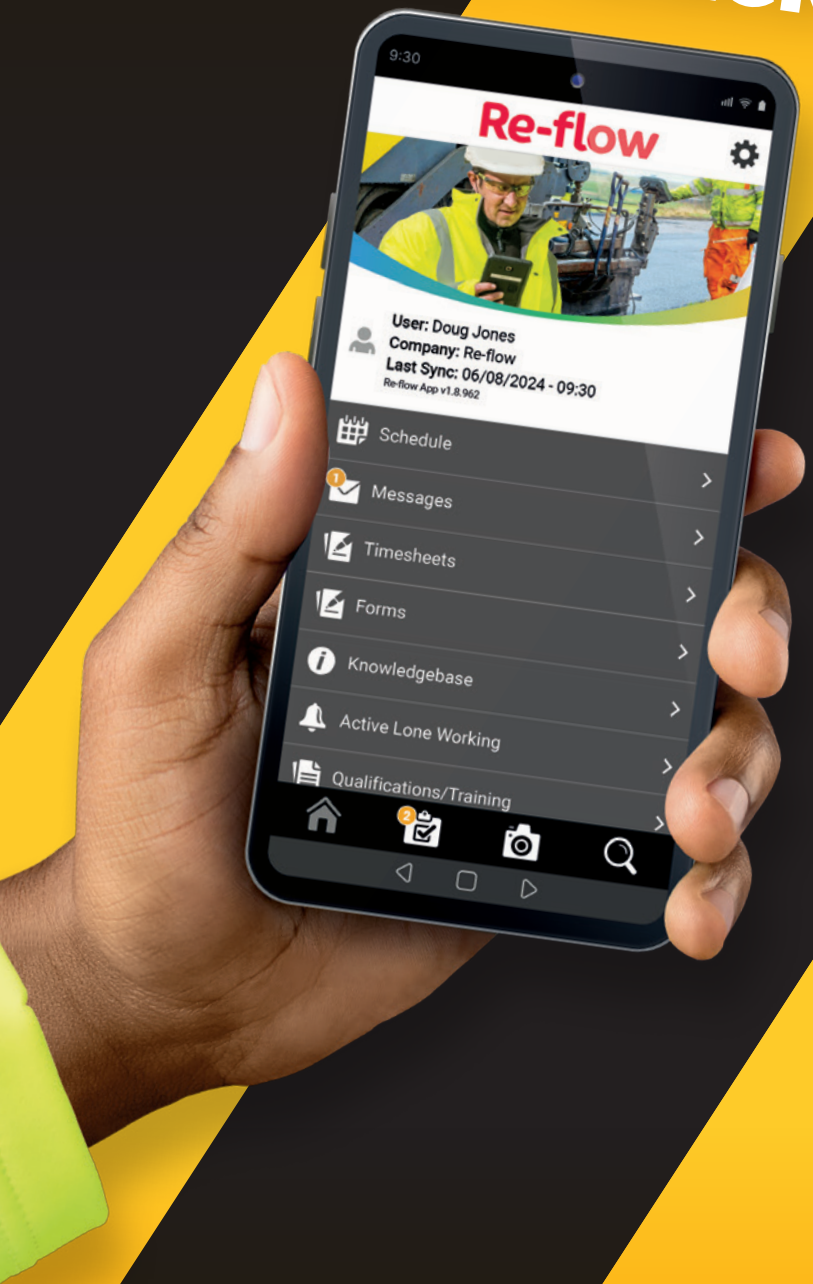

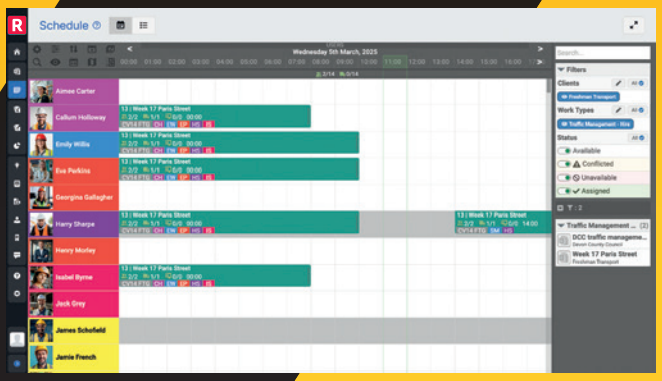

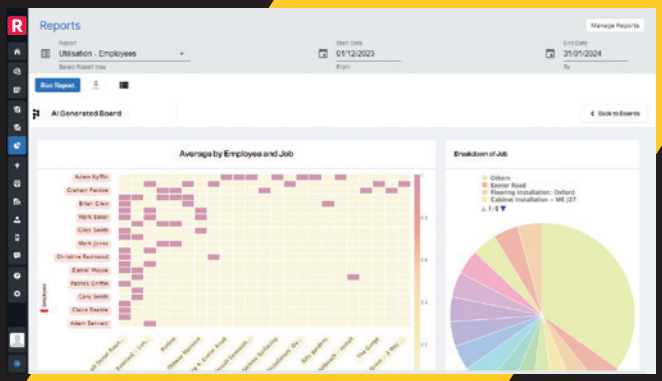

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insight

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EDITOR'S LETTER

Dear Reader,

Welcome to this very special edition of *Insight Magazine*, where we shine a spotlight on the collective responsibility we share in making our roads safer for all. In collaboration with National Highways, this issue explores how organisations, government, and individuals can work together to eradicate preventable road deaths.

Across these pages, you'll find compelling discussions on driver welfare, incident investigation, organisational leadership, vehicle design, and the moral dimensions of safe driving. Our contributors have captured both the human and systemic sides of road safety, reminding us that it is not technology alone but culture, commitment, and courage that will drive change.

The challenge is significant – but so too is the opportunity. Every fleet decision, every training session, every leadership action can shape a safer future. As we learn from the experts and real-life case studies featured here, it becomes clear: safer roads are built not just by policies, but by people.

Thank you for joining us on this journey towards a culture of safety, responsibility, and hope. Together, we can make a difference.

Mark Cartwright
Head of Commercial Incident Prevention
National Highways

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Contents

COVER STORY

Managing Road Risk:

What, why and how?

The third annual National Highways road safety conference, *Managing Road Risk: What, why and how?* on March 25th took vehicle-using organisations to a new level of understanding about how organisations can holistically approach collision prevention. It looked at the roles of many different departments, such as HR, health and safety, and even procurement, many of whom would not traditionally consider themselves involved with fleet or risk – and at how we can implement the Safe System at every level to prevent catastrophe.

Road safety is the number one priority for National Highways. The UK has some of the safest arterial roads in the world, and National Highways' ambition is to eradicate harm on its network entirely. However, road safety is a shared responsibility and it takes all of us to make the roads safe for all those who work and travel on them.

National Highways' Chief Highways Engineer Mike Wilson told the conference that the National Space Centre venue reminded him of the famous John F Kennedy speech: "We choose to go to the moon... not because it's easy, but because it's hard... because that goal will serve to organize and measure the best of our energies and skills.' We are here today because we choose to tackle the challenge of road safety, not because it's easy, but because it's the right thing to do."

Mike Wilson, Chief Highways Engineer, National Highways

Mike Wilson, Chief Highways Engineer, National Highways

> ***We choose to tackle the challenge of road safety not because it's easy, but because it's the right thing to do.***

Road safety, he said, is a societal and moral imperative. Moreover, it brings substantial benefits to organisations in terms of staff retention, reduced costs and downtime, and better productivity.

He urged delegates to realise that they have a golden opportunity, right now, to make their people safer and to help achieve a lasting legacy in terms of road safety. Collaboration, shared responsibility and knowledge-sharing underpin a continuous drive towards better safety outcomes.

He asked the delegates to consider all the stakeholders in their road safety ecosystem – the drivers, human resources and health and safety professionals, operational and fleet managers, subcontractors, the board and, of course, their customers. All of these people bring expertise and opportunity to drive continuous learning and profitable change.

Wilson also echoed the words of Mark Cartwright, National Highways Head of Commercial Vehicle Incident Prevention, in explaining why the road safety conference is aimed at vehicle-using organisations. Cartwright said that the key to improving safety on our roads is for organisations who use vehicles to manage, control and minimise their road risks.

Over half the vehicles on the UK's arterial roads at any one time are being used for business – at some points in the day that proportion will be even larger. This includes almost all trucks, vans, buses, coaches and specialist vehicles – and some estimates suggest up to 14 million cars are also used for business.

This gives us, collectively, an enormous opportunity to prevent collisions – because while it may be hard to influence or change the behaviour of millions of autonomous individuals, it is possible to manage, influence and change the behaviour of millions of employees. Organisations influence and control employees' behaviour all the time, expecting high standards of health and safety, of professional courtesy, or adherence to codes of operational practice and conduct.

And we know that vehicles don't crash – people do. Vehicle condition, weather and road conditions are not the primary cause of collisions. The primary cause is, quite simply, the decision made – or not made - by the person behind the wheel.

So we need to ensure that employees drive in a way which represents the professional courtesy, compliance and safety that organisations would require in any other setting. And, just as in any other commercial or professional setting, the employee is legally responsible for that employee's health and safety, and that of the other road users an employee may encounter.

This means having robust processes for:

- Managing vehicle compliance
- Managing driver safety
- Managing driver health and wellbeing
- Investigating the causes of collisions to prevent their recurrence
- Leveraging the power of procurement to expect all suppliers and contractors to manage their road risk
- And knowing the what, who and why of road risk management.

These issues were all covered in depth by the speakers in the road safety conference, and are backed up by resources and more information at drivingforbetterbusiness.com (DfBB). DfBB is National Highways' award-winning fleet engagement platform, and as such all its resources are free to use, and are designed to be practical and easy to understand and implement.

Five people will die on UK roads today and many more will be injured. These people are not statistics – they are individuals, with partners, children, family, friends and colleagues. They matter. The collisions they are involved in will devastate countless people whose lives will be forever changed, even if they were not in the vehicle at the time.

Are you ready, asked Wilson, to do your part to end these preventable tragedies? What one thing will you do today to make your fleets safer?

Preventable and predictable

The third and concluding chapter of the *Managing Road Risk* video trilogy was seen by delegates for the first time.

The first video introduces us to five drivers who are about to meet each other in the most unfortunate way. Colin, a bored, lethargic 62-year-old truck driver. Ben, an 18-year-old apprentice fitter, who has 'borrowed' his Mum's car to deliver a part, not realising he's not insured. Having only recently passed his driving test, he's nervous.

Gina is an ambitious 28-year-old sales rep who is determined to make her mark – and her quota. She routinely makes and takes business calls while driving. A skilled driver, Gina is nonetheless over-confident and doesn't realise that she can't focus on work calls and driving at the same time.

Slobodan is a 40 year old facilities management technician. He works hard and strives to meet the 'stretching' targets set by his firm, which means clocking up a high mileage. He's impatient.

Nimal is a 35-year-old delivery driver who has recently split from his partner and is couch surfing. He's tired, depressed and agitated.

When the collision occurs, affecting all of them to different degrees, it isn't hard to see how their various attitudes, physical and mental conditions played into the unfolding incident.

The second chapter shows the fall-out of the collision. Gina was held responsible as she veered out of lane while making a call, over corrected and hit Slobodan's van. Unfortunately he is traveling at 80mph, and swipes Gina's vehicle aside before crashing into Colin's truck.

Slobodan's injuries are severe and compounded by unsecured equipment and his excessive speed. He loses his job and isn't fit enough to continue working.

Gina loses her licence for one year.

However, the repercussions don't stop there. The companies involved are also to blame. Hard questions must be asked of all those who manage these people including the directors, the HR manager, the H&S lead, and the operational managers, and the impact of the collision badly affects the comms team and the finance department.

Neither Gina nor Slobodan's company had driving for work policies, nor did they have named individuals with responsibility for managing employees' road risk as a H&S issue. They fail to manage driver welfare, and they fail utterly to manage suppliers and contractors.

The final chapter of the *Managing Road Risk* trilogy looks at what happens to these employers, and what steps they must take to ensure that their road risk is managed going forwards. Mark Cartwright talks us through the Swiss cheese model of collision causation – that incidents occur when multiple gaps in different layers and areas of management align.

For instance, had Gina's employer had a proper driving for work policy, which prohibited making calls when driving, she wouldn't have lost control of her vehicle.

Had Slobodan's employers insisted through their driving-for-work policy or their telematics monitoring that speeding was not acceptable; or had their targets not been so stretching, he wouldn't have been travelling at 80mph. At 70mph, perhaps he would have missed Gina's car, or been able to stop in time, or suffered a far lower impact speed. Had his employer insisted on proper load security, perhaps his injuries would not have left him unfit for work in his prime.

It is rarely one failure which leads to a collision but a confluence of them. This video shows how layers of policy management, supported by several departments, and enforced by a culture of safety can ensure that errors and failings are identified, mitigated and rectified before they can cause harm.

You can watch all three *Managing Road Risk* videos on the Driving for Better Business YouTube channel, or find them on drivingchange.info.

Join Driving for Better Business

DfBB recently won Support Services Provider of the Year and Fleet Supplier of the Year at the 2025 Fleet News Awards, despite overwhelming competition from 24 other entrants. The judges said that National Highways stood out with its Driving for Better Business initiative because it had one aim: to help vehicle using organisations reduce collisions and make their people safer. It offers webinars, case studies, toolkits, driver learning resources, management guides and videos, and a driving for work policy builder – all at no cost to fleets. DfBB doesn't charge fleets anything, and it isn't selling anything – its job is simply to provide first-class, best practice tools and advice for directors, health and safety professionals and fleet managers throughout the UK.

So what are you waiting for? Check out **drivingorbetterbusiness.com.**

Lilian Greenwood MP, Minister for the Future of Roads at the Department for Transport, told the conference that while we should be proud that the UK has some of the safest roads in the world, "we can do better. We must do better".

She reflected that almost 30,000 people were killed or seriously injured on our roads last year, and that people who drive for work are at particular risk. Half of the vehicles on our roads at any one time are driven for work, a UCL study in

> ***"It is rarely one failure which leads to a collision but a confluence of them.***

Lilian Greenwood MP, Minister for the Future of Roads

> ***This isn't just a job for government. It's a shared responsibility. Government, businesses and drivers all have a part to play.***

2020 found that around one-third of all fatalities involve a working driver, and 40% of pedestrian fatalities involve an at-work driver. Transport for London estimates that half of all those killed or seriously injured on the capital's roads are involved in collisions with an at-work driver or rider, and the vast majority of those casualties are not the drivers or riders themselves, but other road users.

While it is crucial to prevent collisions to save lives, the Minister said, the benefits of safer roads will also deliver economic growth, support greener travel, take pressure off our NHS and most importantly, make sure that everyone, from cyclists to lorry drivers, can travel without fear.

"That's why we need to be ambitious about tackling this issue," said the Minister, "and I say we because this isn't just a job for government. It's a shared responsibility. Government, businesses and drivers all have a part to play."

For the first time in over a decade, the government is developing a new road safety strategy, she said. "Together we can build a system that accepts that people make mistakes, but refuses to accept the level of death and injury we see today."

Part of road safety is behaviour, but part of it is also about infrastructure, she said. The government has pledged £1.6bn in highway maintenance funding for the 2025-26 financial year to highways authorities across England. That's an additional £500m in comparison to last year, and the equivalent of fixing up to seven million potholes.

The government is also investing £43.5m to create better greener and safer places for HGV drivers to rest.

Progress is also being made regarding tackling unsecured loads. Last year, DVSA supported by HSE published new guidance on load safety, including for the first time, a section on scaffolding loads. "That may sound like a small change, but it's important. Because when loads aren't properly secured, they become lethal.

"I'm deeply concerned and, frankly angry, that another key risk is drink and drug driving. In 2022 drink driving was responsible for 6% of serious injuries and 18% of road deaths. The number of fatal collisions where drivers had drugs in their systems was also worryingly high, between 19 and 30%. That's why, earlier this month, I opened a symposium marking 10 years since drug driving became a criminal offence. The event was a chance to reflect on what's been achieved so far, but also to discuss what more we need to do."

Employers, she said, have a crucial role to play in preventing drug driving, by educating drivers, promoting workplace testing and offering support to identify and stop problems early.

She urged all companies to "do your bit. Treat road risk the same way as you would any other workplace risk. Set clear expectations, hold your suppliers and customers to the same standards and use the fantastic resources available through the Driving for Better Business programme."

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KEY WAYS TO CUT ROAD RISK

Stefan Szrama, Mitie

The National Highways conference looked at three specific actions fleets could take immediately to cut road risk – and produced the resources to support them.

Incident Investigation

National Highways' *Incident Investigation Toolkit* walks you through how to actually conduct a post-collision (or near miss) investigation and report on it to deliver the best possible learning outcomes.

It also provides key documentation for your use – bump cards, report templates and a guide to deciding culpability, which can be branded or edited to suit your organisation. The aim of the guide is to make your incident investigations as straight forward and fruitful as possible, regardless of your level of experience.

Stefan Szrama of Mitie, who helped to create the incident investigation pack, talked the conference delegates through what they could learn from incident investigation. These reasons include better compliance, brand enhancement, improved employee engagement, and better decision-making among many others.

However, the biggest reason of course is to identify the causes of a collision so that similar incidents can be prevented in the future.

Incident investigation is one of a fleet's best and most useful tools for identifying the causes of its own collisions, whether those belong to the individual driver or to the organisation, or elsewhere.

The seriousness and scope of an investigation is determined by the worst potential outcome of such an event, multiplied by the likelihood of its recurrence. This then determines how much resource and urgency you may apply to the investigation.

Szrama said the guide breaks incident investigation down into four stages: and each must be completed in chronological order for the best results. Gather information, analyse it, determine immediate, underlying and root causes

> ***To make a genuine difference to collision risk, we need to understand the root causes — not just what went wrong, but why it happened.***

(continued on page 14)

Dr Grant Charlesworth-Jones, Chairman, D4Drivers

> ***There can be no meaningful risk assessment if the driver has not had any medical assessment.***

and then develop recommendations. If you cut corners – for instance talk to the driver, find an immediate cause and hurry to making recommendations – you lose the opportunity to develop deeper and broader insights.

To make a genuine difference to collision risk, we need to understand the root causes of a collision. Not simply: what did the driver do wrong (for example), but why did he do that? If it was fatigue or distraction, for example, why did that occur? Is it a result of scheduling, a lack of training, poorly constructed or poorly communicated policies, or did the driver knowingly act in defiance of policy?

Szrama suggests a 5 Whys approach to determining the immediate, underlying and root causes of errors and violations.

Investigations rely on gathering data from all the potential sources – everyone involved and hours, driving record, training and telematics data etc. Then that data should be analysed to find the connections between the event which took place and the factors which contributed to it. It's important to be thorough and proportionate, and to act within a just culture framework which values accountability but accepts that most incidents are not the result of one person's actions alone but have been allowed or shaped by the management and operational context in which they occurred.

In addition to the *Incident Investigation Toolkit*, national highways will soon release a booklet illustrating of how the toolkit works, based on two fictional case studies.

Driver Roadworthiness: managing health and wellbeing in at-work drivers

Dr Grant Charlesworth Jones, doctor and barrister as well as the Chairman of D4Drivers, said that employers need to be far more proactive about assessing and maintaining driver health, because driver health has an immediate and direct impact on collision risk.

Vehicle using organisations are usually familiar with 27-point pre-use checks which drivers must undertake for their vehicles before each shift. Yet there is no corresponding check to gauge a driver's fitness for the road, despite drivers being a primary contributor to collision. "This is a glaring vacuum in compliance and risk management which cannot continue," he said.

Moreover, HGV drivers have a medical assessment on gaining their licence and are not required by law to have another until they turn 45. For many that's a gap of 27 years. Van and car drivers are not required to have medical assessments, barring a 20m sight test, before they turn 70. In this the UK lags behind European and international counterparts.

In the event of a collision, employers must have evidence that the driver was as roadworthy as the vehicle – yet most would be able to point to nothing except a decades' old basic assessment.

The medical assessment form for drivers was created before the invention of the iPhone – yet while iPhones are now on their sixteenth incarnation, the medical assessment has barely changed.

D4Drivers will be partnering with Professor Stacy Clems of Loughborough University to conduct the largest ever survey of driver health, to determine emerging health trends, and failings in driver healthcare systems and how to solve them.

Charlesworth-Jones said the prevalence of disease in drivers is twice that of age and sex-matched cohorts in other sectors – and the more unhealthy the driver, the greater the likelihood and likely severity of collision.

There are more undiagnosed cases of diabetes in the Uk than ever before, and cardiovascular disease and sleep apnoea are occurring at younger and younger ages.

He said that there can be no meaningful risk assessment if the driver has not had any medical assessment. He said employers should have driver health assessed on recruitment, and then every three years to be in line with other countries' legislative frameworks.

In particular drivers should be tested for cardiovascular disease, sleep apnoea risk and diabetes, which would include fingertip blood testing to assess glucose and cholesterol levels.

There are no losers in this scenario, said Charlesworth-Grant, as drivers will get better health outcomes, employers' greater productivity, the UK economy and health service will benefit – and our roads will be safer.

National Highways has produced a comprehensive guide for employers *Driver Roadworthiness: managing health and wellbeing in at-work drivers*. It covers the most common medical conditions, including their potential road safety risk; human factors (stress, fatigue etc), lifestyle factors, and personal circumstances such as the implications of second jobs, being a carer, grief and new parenthood. The guide also considers the testing available, and its legal framework; and mental health provision. Each chapter has simple practical suggestions about how employers can manage and support individuals to ensure their best medical and employment outcomes and make them safer on the roads.

The guide can be downloaded, along with all the other resources launched at the conference, from the QR code.

Driving for Better Business

National Highways' free award-winning fleet programme Driving for Better Business (DfBB) has one main mission, said Anne-Marie Penny, Programme Lead, "to improve safety for all those who drive or ride for work". This mission is delivered through a wide array of resources, free to all employers, including case studies, videos, podcasts, toolkits, a gap analysis and a driving for work policy builder.

As well as the resources highlighted above – the *Incident Investigation Toolkit and Driver Roadworthiness* guide – other new resources will be available soon.

Penny traced the history of road safety in the UK, from the post-war years when traffic numbers began to rise and the mid-1960s when the government first looked for a strategy to curb rising casualty numbers.

She outlined the legal, moral and financial reasons for employers to control road risk in their at-work drivers. The DfBB programme is designed to show employers how they can assess their road risk (through gap analysis), develop a driving for work policy (using its easy editable tools) and continue their road risk management by using the extensive practical and training tools provided.

Anne-Marie Penny, Programme Lead, Driving for Better Business (DfBB)

In doing so, they will not only improve their legal compliance, make their employees safer, and enhance their brand, but they will also reap substantial financial benefits. Fleets with good risk management have lower costs including repairs, insurance and fuel, but also better productivity, less downtime and better employee engagement.

In 2019 – the last year for which the purpose of the journey was included in collision statistics – 203 people died in the workplace, including employees and members of the public. However, 528 people died in work related collisions.

The moral case for employers addressing road risk as a health and safety priority is therefore overwhelming.

DfBB, she said, is free for all organisations or employees to access and benefit from. It has an extensive range of partners from all areas of the legal, medical, automotive and fleet world who contribute their expertise, to make it easy for any manager to get the practical information and support they need to start or further their road risk journey.

It fits within the Safe System framework, in which delivering safer vehicles, safer road users and safer speeds are three of the five areas in which fleets can offer immediate and meaningful progress.

However, there is a price for not managing road risk - a price we all pay. Achieving zero harm on our roads is a shared responsibility, with each of us required to do our part.

Together we can achieve change.

See drivingchange.info for the complete presentations from the Managing road risk conference.

The Car Driver Toolkit

Following on from the award-winning success of the Van Driver Toolkit, the Car Driver Toolkit gives fleet and other managers a comprehensive series of topic toolbox talks, mini training sessions and essential car driver safety information. Broken down by topic into short pdfs, these can be easily shared with all drivers or used as the basis for training sessions.

The Car Driver Toolkit will be officially launched at the CV Show (29 April) and will then be available from download from the QR code.

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Daryl Wake, Dekra

What's Your Real Exposure?

There is a huge challenge facing health and safety professionals, said Daryl Wake, Business Development Director of safety consultancy Dekra – one which threatens to overturn a major orthodoxy behind health and safety science.

The problem is that while recordable and lost time injury incidents have been declining globally, serious and fatal incidents (SIF) have stayed level or even increased. This goes against the Heinrich model of accident causation, which said that the ratio between minor incidents and catastrophe was relatively fixed – and therefore by reducing minor incidents we could prevent catastrophes from occurring.

Research undertaken by BST (Behavioral Science Technology, Inc. now DEKRA) and Mercer ORC Networks and seven leading global companies showed that in fact low level incidents could be categorised in two ways – those with high potential for being serious and those with low potential for being serious. Therefore, a slip at height could potentially have a very serious outcome, while a slip in the office has a much lower potential for serious injury. They may both in fact have had the same outcome – but one could have had far more serious ramifications.

This means that organisations can believe they are doing well in terms of driving down safety incidents only to be blindsided by a tragedy they didn't see coming.

The research showed that about 20% of recordable and lost time incidents had the potential to be serious or fatal incidents. Therefore, prevention strategies do not simply need to target those incidents at the bottom of Heinrich's triangle – the low-level incidents – but it must specifically target those with the greatest potential for serious harm.

However the study showed that the following activities were likely to include a very high proportion of precursors:

- Vehicles and mobile equipment (operation and interaction with pedestrians)
- Confined space entry
- Working on energised equipment (eg jobs that require lock-out tag-out)
- Lifting operations
- Working at height
- Hot work

Furthermore, 90% of injuries involving 'vehicles and mobile equipment' had the potential to be SIF.

The causes and correlates of serious and fatal injuries are quite different from those of low-potential incidents. Serious and fatal incidents are far more likely to involve breaches of cardinal or life-saving safety rules. Other low-level incidents tend not to be related to basic safety systems but to other factors.

> ***Organisations may think they're winning on safety — until a serious incident proves otherwise.***

If we don't identify high-risk precursors now, we risk facing preventable tragedies tomorrow.

Life-saving rules are crucial – but they are the last line of defence. If they fail, then a fatality becomes inevitable.

High risk incidents tend to result from precursor situations – unmitigated high-risk situations which will eventually lead to a serious or fatal incident. Wake describes these precursors as "high-risk situations in which management controls are either absent, ineffective, or not complied with and which will result in a serious or fatal injury if allowed to continue."

Organisations must identify these precursor situations, said Wake. If companies only focus on recordable injury data and not at SIF potential incidents, then they have a huge blind spot which may eventually result in a serious or fatal injury. These are typically not one-off events.

The research identified four prevention elements:

1. Educate the organisation on the new model of incident prevention, ensuring engagement in any SIF prevention programme.
2. Measure serious/fatal incident (SIF) as a category and any incident which has the potential to be SIF needs to be treated with a higher degree of rigour as those that are actuals. But do not stop paying attention to lesser injuries.
3. Create processes to identify precursors – this is the basis for the prevention strategy
4. Integrate SIF with existing safety systems.

"Collision reporting and investigations are not as good as you think they are," said Wake. He said that companies should focus on SIF exposure, and not only on controlling the behaviours of employees. The most effective controls for managing exposure are:

1. Elimination – eg is the journey necessary?
2. Substitution – eg can drivers take a different route, or drive during the day rather than at night?
3. Engineering controls: can ADAS or speed limiters help prevent driver error?

These will be more effective than relying purely on fixing employees' behaviour, such as through admin controls, PPE, discipline or incentives. This is because the latter identifies employees as the cause of the risk exposure, rather than changing the risk exposure. Admin controls, PPE etc are all still necessary – but organisational, operational and engineering solutions actually reduce or eliminate exposure, rather than simply trying to manage it.

The study showed that 87% of SIF precursors were identifiable through observation and interviews. Organisations that leverage in-vehicle management systems (eg telematics) or driver observation programmes, driven by leadership, accountability, and fair recognition, consistently outperform those that do not.

People do their best but all humans are fallible. We need top leadership led processes and systems which prevent or mitigate human error. Error is usually caused by human factors – fatigue, group think, memory failure, stress and urgency, emotional and instinctive responses, limitations in our visual processing and distraction.

See the whole presentation at drivingchange.info

Check Your Moral Compass

> ***"It's not only bad apples that spoil the barrel – sometimes the barrel spoils the apples."***

Glen Davis, Managing Director, The Driver Handbook

Glen Davies, Managing Director of *The Driver Handbook*, argues that it isn't only physical and mental health that employers need to be aware of in their drivers – but also moral health.

"Like most professionals, I know the difference between right and wrong, safe and unsafe, and legal and illegal. It's a person's moral health that influences their individual decision making," he said. This leads us to the question: why do good drivers make bad decisions?

He defines moral health as the conscience, a sense of ethics, values and beliefs.

Davies highlighted an incident in which one of his drivers, speeding and tailgating, caused a collision. He was temporarily removed from the road, and had a two-hour session with a driver-assessor – who reported the employee's driving was flawless.

This was harder to manage, therefore, than a driver who had obvious faults or a lack of skill. "This was a very, very good driver who chose to make very, very bad decisions, a much trickier management dilemma," said Davies.

He likened growing the values we need drivers to embody to the evolution of the corporate 'conscience'. It starts with compliance, and efficiency, and skill – but over time it evolves into behaving responsibly, sustainably, having a business one can be proud of and feels makes a positive contribution to society, defined as much by consideration and courtesy as profitability.

It is essential that managers are confident that the processes, policies and culture of their organisation are conducive to making good decisions – because otherwise they cannot know if a driver who makes bad decisions is at fault, or if it the prevailing culture within which they work.

He offered the mantra – ABC: Attitudes, Behaviours and Culture. How we think about our work governs what we do and what we collectively think and do creates our culture. This process is true for building safety cultures, or for building unsafe cultures.

He challenged fleet managers to think about how they view speeding. Do they only act if they receive a penalty notice? Do they tolerate 10% over the limit because the driver is unlikely to be prosecuted? Whether we treat legal violations as an offence regardless of whether we are likely to suffer a penalty for it is a benchmark of our moral health.

Psychological safety is an essential element to growing morally responsible drivers, he said. Psychological safety is the belief that one will never be punished or humiliated for raising a concern, asking a question or challenging and unsafe action. It applies to innovation and productivity as much as to safety, but it is critical to achieving safety in operations.

Having said that, it is a challenging process initially because those deep-seated beliefs which we are often raised with – don't tell tales, be a team player, don't rock the boat – are hard to overcome. Equally managers have to be confident in order to have their decisions questioned or challenged. Psychological safety is a wonderful cultural component to develop, but requires us all to think about how we respond, both when we see something unsafe and when we are ourselves questioned.

Psychological safety allows everyone to grow within their role, and also to take responsibility for their contribution to a safe operation. On the flip side, managers who allow unsafe practices to slide – the 'blind eye' phenomenon – will see safety failings progress from the minor to the major, because not only have they encouraged complacency but their silence suppresses the voices of those who would otherwise have spoken up.

In summary, Davies said it is not only single bad apples which spoil the barrel – sometimes the barrel spoils the apples. "Set the values, create the conditions, and when you write a policy, make sure you live it. Don't turn a blind eye," he said. Managers should have confidence in what they consider acceptable, and by reinforcing that with action, they will shape the way their employees think about what they do.

See the full presentation at drivingchange.info

Phil Gilling, Director, G.R.I.T. UK/USA

Rethinking Safety:

Why Fixing Systems, Not People, Drives Performance

Phil Gilling explained to the conference how the highest team performances are always a result of perfecting the organisation, not the individual.

Phil is the Director and Learning and Leadership Development, at G.R.I.T. UK and USA. (GRIT standards for growth, resilience, integrity and transformation.) He is an expert in human and organisational performance (HOP) and spent 33 years in the RAF, which included flying helicopters, managing a Special Forces Flight, teaching leadership and managing the officer training at the Air Academy at RAF Cranwell. His last RAF role was as Air Safety Manager for the RAF Aerobatic Team, which put risk into a far wider spectrum.

HOP emerged from the US nuclear industry, in which safety professionals found that procedures, policies and penalties for non-compliance did not achieve the safety benefits they hoped – in fact, on their own, they could lead to impaired performance because employees were bogged down in 'red tape' and afraid to admit to any deviations in procedures.

HOP, therefore, emerged as five principles, but overall it represents a mindset. Rather than being reactive to the immediate causes of incidents, it looks deeper at the numerous causal factors, which in turn allows us to be proactive about prevention. Instead of waiting for something to

> ***HOP is not just about safety; it's about performance, quality, and continuous improvement.***

go wrong, we can notice and act upon indications that something may be about to go wrong.

"HOP is not just about safety, it's about performance. It reduces mission interruptions, damage and injuries while increasing discretionary effort," he said. By seeing this as a performance initiative and not purely a safety initiative, the emphasis shifts to performance, quality, and continuous improvement.

PRINCIPLE 1: Like the Safe System, HOP is systems-based, looking at the overall operational context and not simply the individual. And crucially, its first principle acknowledges that people make mistakes – humans are fallible and therefore systems must be designed with that in mind. And once a human has made a mistake, the focus is on what we can do to prevent that from happening again rather than seeking someone to blame.

We cannot punish or reward our way to eliminating errors because they are not intentional. So once we accept that errors are inevitable, we can design systems which identify and prevent 'error traps' – those circumstances which tend to give rise to errors. Examples of this are preventing driving in poor weather, or when drivers are tired, or using advanced technologies and better vehicle design to prevent or cope with human error. Ask drivers where the error traps are in their job.

PRINCIPLE 2: Error-likely situations are predictable, manageable and preventable. A simple example is that removing trip hazards prevents falls. Part of this is an acknowledgement that blame fixes nothing. Blame and punishment mean that people cover up safety incidents instead of revealing them so the underlying causes can be fixed.

Create a psychologically safe environment. Ask open, non-challenging questions. For instane, ask drivers about their role, what their challenges are, do they ever feel they have to take risks? Do their organisational processes and culture induce them to take additional risks? Listen and act to make it easy for people to make the right choices. The vast majority of people are not deliberately negligent – they want to do a good job and managers must remember this.

That said, managers need to notice and manage poor performance, poor attitudes or poor working practices. Accountability is a key part of a just culture, and managers must take responsibility for ensuring that they do not allow standards to slip.

PRINCIPLE 3: Individual behaviour is influenced by organisational processes and values. People do not act in a vacuum – their behaviour is, to some extent, the result of what is allowed, normally practised or valued. We all need a supportive environment that promotes safe and effective practices. This is rooted in organisational theory and the study of safety culture. Consider how leadership, the work environment, processes, procedures, tools, and equipment, affect our people and how they work. People are intrinsically lazy – or, to put it another way, we are naturally creatures of efficiency. We will do things in the fastest or least effortful way possible, and this is the trait which inspires innovation. It's also what makes us take shortcuts, whether on the way home or in a job. However, this is also the reason that training, compliance, or performance data do not on their own make us safe. We need to design systems so that the safest way of doing something is also the most efficient.

PRINCIPLE 4: People achieve high levels of performance based largely on the encouragement and reinforcement received from leaders, peers and subordinates. Positive reinforcement is a key principle of behavioural shaping and change. We do what makes us feel good, and validation by those around us is a key means of reinforcing wanted behaviour.

Consider how you treat people. Engage with them, ask curious questions and actively listen to what they say. This may seem strange to employees initially but as they get used to it, they lose their reticence. (You can also provide other means of giving feedback – such as Post-its, or pairing up with a buddy, or a drop-box.)

Consider what behaviours you actually reward as an organisation. Reward the process, not the outcome. Don't celebrate 'X days without an incident' because no one will come forward to admit they broke that streak. Instead, celebrate improvement and learning.

PRINCIPLE 5: Events can be avoided by understanding the reasons mistakes occur and applying the lessons learned from the past events (or errors). It's about learning and acting on that learning.

See the full presentation on drivingchange.info

> ***We cannot punish or reward our way to eliminating errors, because they are not intentional.***

Jon Hughes, Group Quality, Health, Safety & Environment Director, Mitie

Building a Safety Culture

Jon Hughes, Group Quality, Health, Safety, and Environment Director at Mitie, asked the Managing Road Risk conference delegates: what makes a leader? Is it rank, or position or style? In fact, he said, everyone leads to some degree. We may have different audiences and different roles, but when it comes to safety, leadership is inherent every time we discuss or enact safe behaviours.

The challenge for anyone wanting to create or foster a leadership culture therefore is to engage their stakeholders, whether they are on the board or at the grass roots of the organisation.

The first step is to identify and outline the benefits of a strong and effective driver safety programme. These are reducing collisions and incidents, lowering costs, improving the company's image and improving productivity. Use data and forecasting to quantify the expected or previous benefits.

Some benefits are implicit – Mitie has 12,000 drivers in liveried vehicles so their behaviour has a clear, if not necessarily quantifiable, impact on the brand. However other benefits can be mapped; Mitie has reduced road fleet incidents per million miles by 44% in the last seven months. That's a great news story for the board and also for drivers.

> ***Leadership is inherent every time we discuss or enact safe behaviours — it's not about rank, it's about responsibility.***

> ***We all have a voice, and we must use it to help prevent these daily losses.***

However, at times you also have to present the bad news, said Hughes. Mitie saw incidents of drivers speeding, or covering their dash cams so that their behaviour wouldn't be witnessed. "There was a point when we presented some of the negative data that we've got, the numbers of people who were potentially speeding or performing other undesirable behaviours," he said. "You have to consider how you want the message to land. Is it a good news story? Is it a call to action? Is it: there's a problem here. We need to fix this. This is how we're going to do it."

The next issue is how you reach the hearts and minds of the wider audience he said. Five people each day lose their lives; each of those people will have known, on average, 150 people; over the course of a year these deaths therefore affect 273,750 people. That's enough to fill Wembley Stadium more than three times over.

That's why we all must act as leaders, said Hughes. Whether we are influencing policy, or corporate boards, or simply friends, families and colleagues, we all have a voice and must use it to help prevent these daily losses.

Management consultant and author Peter Drucker said: "Culture eats strategy for breakfast." In other words, even the best strategy is useless if the prevailing culture doesn't make it a reality.

Hughes gave some key points to help build that culture:

- Ensure that leaders model the behaviour they want; they should follow the same rules as their employees; and they should visibly participate in discussions, workshops and road safety activities.
- Encourage feedback in a psychologically safe space. Acknowledge feedback and let people know whether it is being considered, or acted upon.
- Provide feedback. Give all colleagues regular updates on how road safety initiatives are performing, capture safety moments, news stories, flash messaging or toolbox talks
- Monitor performance. Capture data across all your key risks and priorities for improvement.
- Engage the drivers who are flouting rules, exceeding speed limits or driving without a break. Don't just admonish – find out why they drive like that, and whether it is a personal or training issue, or organisational pressure.
- Reward compliance. Recognise those employees who consistently follow safety rules.
- Regularly review the policies, the practices, the technology and the behaviours to ensure that you are still improving and your safety approach is still fit for purpose. Mitie uses telematics, dash cams and inward facing cameras which alert the driver of fatigue or distraction.
- Fleet and H&S managers must not neglect their own professional development, because as health and safety professionals they need to be continuously building on their knowledge and sharing experiences and learning.
- Analyse the data and reflect on whether it has achieved your objectives. What are the trends? Is it moving in the right direction? Are there new issues to be tackled? Plan, do, check, act.
- Keep an eye on the horizon. What are the new technologies, drivelines, risks, challenges and opportunities. For instance, said Hughes, electric vehicles present new risks, but they also present opportunities. Top-up charging, for example, gives a new reason to underscore regular driver breaks.
- Know your key points of contact. Who is responsible for infrastructure, for vehicle maintenance, for training, for compliance, or for procurement? Knowing these individuals allows more effective and immediate conversations.

Watch the whole presentation at drivingchange.info

Towards Life-Saving Vehicles

Commercial vehicles lag way behind cars in terms of design features – and Euro NCAP is working hard to change this.

Driver assistance and driver monitoring tools can combine with safety-by-design features to prevent and mitigate collisions. However, until 2020 Euro NCAP's safety testing focused only cars, so manufacturers had little incentive to include more than the statutory safety requirements, says Matthew Avery, Strategic Development Director.

When Euro NCAP first turned its attention to commercial vehicles, the discrepancy between the non-statutory safety options included with cars and that of vans and trucks was glaringly apparent.

When it began testing vans in 2020, Avery says while a few achieved two star status and some even three, the results were dismaying. "The performance was generally disappointing in all of the active safety systems that we tested, which looked at AEB car to car, AEB for pedestrians, AEB for cyclists, Lane support systems, speed assistance systems and driver monitoring systems."

However, vans are now much closer to replicating the success seen in the car world,. He says: "Fast forward to 2024 and things look very different. We now have many of the vans with bronze, silver and gold ratings, and we even have one with a platinum rating, which equates to five stars, after just four years of testing."

HGV testing

Euro NCAP is now turning its attention to HGVs because while trucks make up just 3% of the vehicle parc, they are involved in 15% of fatal collisions. "And, while they are bound by General Safety Regulations (GSR2), there's still scope for them to get much, much better. HGV collisions tend to affect those around the truck and not in the truck, so 90% of HGV-related fatalities are not HGV occupants, but pedestrians or vulnerable road users," says Avery.

Typically HGVs involved in motorway collisions tend be larger and heavier and the casualties are usually car occupants, while in urban areas where we see smaller trucks, and casualties tend to be vulnerable road users. So the testing regime needs to reflect this disparity in weight and size. Euro NCAP has a programme of testing for trucks from many different sectors over the next few years.

Euro NCAP's testing assesses safety in four pillars that represent the timeline of a typical crash scenario: driver assistance where vision is crucial; crash avoidance where AEB technology can potentially avoid a crash; crash protection where seat belts and airbags play their part; and post-collision access – the golden hour for the emergency services. Crash protection (featuring actual crash testing) will be added in 2031.

The first release of HGV results were of long-haul trucks tested in 2024, and their rigid equivalents which will be tested in 2025. So far the safest trucks, he says, which score highly across all three categories of driver assistance, crash

Matthew Avery,
Strategic Develop Director, Euro NCAP

HGVs make up just 3% of vehicles — but are involved in 15% of fatal collisions.

Matthew Avery

avoidance and post-collision access, are Volvos, which couple good collision avoidance technology with good levels of direct vision.

Stakeholder involvement

Promoting the safety aspects of commercial vehicles is a different proposition to selling safer cars, which had immediate appeal for motorists. In the B2B sector there are many operational and financial considerations for fleet buyers, and vehicle safety may not make be a priority unless it's proven essential.

Hence, Transport for London's Direct Vision Standard is the latest in a line of levers the authority has used to force manufacturers to provide either direct vision or progressive safe system technologies which replace direct vision. Local authorities and National Highways have some influence in this sphere as do freight owners, but the definitive conversation must happen with the logistics operators.

Euro NCAP is therefore looking to work with all its stakeholders, hoping that freight owners and insurers will encourage, persuade or mandate fleets to buy the HGVs offering the highest safety standards, not only to fulfil their duty of care to their drivers but also to other road users.

Some of the truck tests also apply to cars and vans, such as autonomous emergency braking (AEB) , lane support, emergency lane keeping, driver monitoring and speed assistance. However, there are also unique tests for trucks, including direct vision and indirect vision technologies, AEB for pedestrians, and for cyclists at the front, side and during nearside turning.

Some collision avoidance – such as moving off information systems (MOIS) – are already seen on some HGVs through London's direct vision standard, although often as third-party and after-market solutions. The General Safety Regulations 2 will also include MOIS and blind spot information systems on new trucks from mid-2024. However, these systems do not necessarily integrate with automatic emergency braking – in other words, they alert the driver of a hazard but they do not necessarily stop the vehicle. Active MOIS which will automatically brake the vehicle will form part of the 2028 protocols, putting the vehicle manufacturers on notice that this will be the next requirement.

In addition, says Avery, only two manufacturers currently have a 'turn across path' avoidance system, in which the truck sensors can detect a cyclist on the inside of the vehicle prior to a turn and apply the brakes automatically. This technology is vital in cities.

Euro NCAP will lift the bar every 3 years encouraging manufactures to increase the safety on their vehicles making 5 stars ever harder to achieve.

In 2031 it will start to look at passive safety in trucks – how well the structure of the vehicle disperses energy and protects occupants. These new tests will feature actual crash tests with dummies and aim to protect the driver whilst also sharing the energy of the crash with the opposing vehicle – protecting the car occupants further.

Avery says new regulatory decisions, allowing lengthened front ends for fuel efficiency, will allow greater scope for safer cab designs by elongating the fronts allowing for more crash absorption.

IMPROVING COLLISION SURVIVABILITY

Consultant Tim Nutbeam is working on better ways to improve occupant survival post-crash.

Bystander aid can be a literal life-saver in the event of a collision. Consultant in Emergency Medicine Tim Nutbeam told the conference how new learning has empowered witnesses to collisions to take an essential and immediate role in ensuring that all those involved in a collision stand the best possible chance of a good outcome.

Bystander intervention can be the difference between life and death.

The EXIT Project studied several years of post-collision patient records to see which factors made the most difference to medical outcomes. One of its first game-changing revelations was that patients who are not physically trapped within wreckage should be removed from it as swiftly as possible.

For many years the prevailing orthodoxy has been not to move vehicle occupants to prevent causing or exacerbating spinal injury – but in fact only 1% of patients have spinal injury, their slow and careful removal does not prevent the injury, and they face far greater risk of death if left in situ. Overall therefore, the EXIT project has changed ideas around medical entrapment following collisions. (See last year's presentation by consultant nurse Rob Fenwick on the Driving for Better Business website.)

If vehicle occupants are able to step out of the vehicle, without undue risk, then they should do so. This improves the individual's medical and psychological outcomes, and it also allows roads to be opened faster and for the more rapid transfer to hospital. If the occupant is unable to get out of the vehicle themselves, then they should await police, National Highways staff or paramedics. Bystanders should never lift or drag someone from a vehicle unless their life is in immediate danger from another factor, such as fire.

Fleet drivers should have training about how to implement the U Step Out protocol, and not advise patients to move if they have not had such training.

The process by which we try to save lives post-collision is called the chain of survival.

The chain of survival is:

- Early recognition and 999 call
- Early rescue
- Early initial care – clearing airways and stopping bleeding
- Early transport to the correct hospital
- Early hospital care and rehabilitation

The first step is to make an excellent 999 call – bystanders should not assume that someone else has already done so. Drivers should be trained to give all the information first-responders will need, including the number of casualties, the severity of injuries, and the accessibility of the site. Details such as which lane the vehicles are in, and whether there are complicating factors such as animals, or a hazardous load can also be relevant to the police and National Highways.

Drivers should be trained in basic triage – assessing how injured someone is and prioritising immediate actions. If the 999 call correctly identifies the severity of injuries, it allows emergency services to prioritise care between those who need immediate life-saving attention and those who can wait a little while without harm. This is important because for every patient who will require a critical care doctor on scene, there will another 800-900 emergency calls about road traffic collisions. It is essential to know exactly where that doctor is needed.

Bystander intervention can be the difference between life and death, says Nutbeam because critical care clinicians will rarely be in place quickly enough to

Tim Nutbeam, Consultant in Emergency Medicine

> ***Know the basics, train the basics, and flawlessly execute the basics of post-collision response.***

take those first crucial steps in the chain of survival. These aren't usually complex first aid, or even CPR, but more often simple steps like clearing the airway or stopping bleeding.

In future bystanders may be able to play a greater role. Non-compressible haemorrhage - internal bleeding from organs - is the leading cause of death in road traffic collisions. Tranexamic acid (TXA) is a drug which helps the body to clot, and has a proven track record in preventing this cause of death. Clinicians are lobbying to make TXA a 'Section 17' drug which could then be administered by bystanders, police or paramedics as an emergency protocol to prevent internal haemorrhage. It can be injected into muscle but the auto-injector is still subject to approval.

Ambulance crews also need to be able to make crucial decisions, such as choosing the correct hospital for the type of injury, and forewarning clinicians of the resources they may need such as transfusion products, radiology resources, or the readiness of a theatre and surgeon. This facilitates the final stages of the chain of survival – early transport and early hospital treatment.

This optimised post-collision response fits into the safe system, alongside safe speeds and safe road users. However, training road users – especially high-mileage drivers – to know how to respond will be vital to ensuring that chain of survival.

Know the basics, train the basics and flawlessly execute the basics of post-collision response, says Nutbeam, and you and your drivers will help to save lives.

Witness a collision?

- Make a great 999 call
- Clear airways
- Control bleeding
- Reassure them that you are there, and you will keep them safe until the medics arrive

See the full presentation at drivingchange.info

Human Errors in Driving

Distraction, fatigue, and pressure are silently shaping workplace safety outcomes every day. Professor Tim Marsh challenges leaders to understand the psychology behind risk — and how culture can prevent catastrophe.

Professor Tim Marsh, founder of the Anker & Marsh consultancy, was a team leader for the original UK research into behavioural safety in construction in the early 1990s. He is considered a world authority on the subject of behavioural safety, safety leadership and organisational culture. He told the conference that the average person, despite being in ideal conditions and fitness, spends an average of five minutes in every hour inattentive and 'away with the fairies'.

However, for most of us the proportion of time we spend without true situational awareness is far greater than that, because we are tired, hungry, in pain, on medication, miserable or a thousand other things which otherwise degrade cognitive focus.

So for site safety, we could say that we are more likely to fall foul of hazards when we are inattentive – so we need to deal with those hazards when we are alert and can notice and manage them. That way they are eliminated before we are tired or distracted and are likely to injure ourselves or someone else.

And for many individuals their performance is significantly compromised for at least half the time, due to mental health issues, sleep deprivation, grief, financial worries or relationship or family issues. Statistics suggest at any one time 20% of the population has a mental health issue – even allowing for over-reporting, this is a huge proportion of the workforce.

The three biggest issues affecting driver safety are fatalism (not caring, not feeling they can change outcomes), distraction and bad decisions.

Safety improvements require a learning culture. And that means being prepared for failure. Marsh cited the multiple world records held by champion jockey Tony McCoy – but he also holds records for breaking every bone in his body, and for losing more races than any other jockey in the world. Success often goes hand in hand with failure because when we try to achieve anything, failure is almost certainly an outcome at some point.

Failure is also our greatest learning opportunity.

Temptation theory is a big part of understanding errant behaviour. Every action has an antecedent, a behaviour and a consequence. The Antecedent might be policies and training. The Behaviour is how the person then drives. The Consequence can be certain or uncertain, soon or delayed, positive or negative.

Most organisations said Marsh believe that if they get the A of this ABC correct, then the behaviour will automatically be the desired one. However, 90% of the time it is consequence which determines human behaviour. Anything with a soon, certain, or positive consequence is a temptation. We

Professor Tim Marsh, Anker & Marsh Consultancy

> ***We spend far more time 'away with the fairies' than we think — and that's when the hazards win.***

each have a different propensity to give in to temptation but for many the perceived benefits of speeding or jumping red lights, will always seem to offer a 'soon-certain-positive' benefit. What they don't consider is that it is a huge risk.

People have both a risk tolerance and an appetite for risk. If people perceive something to be too safe, they will sometimes add risk in order to heighten their experience.

We can now see what happens in people's brains depending upon how they believe they have been treated. If they perceive their treatment is unfair the areas of the brain which light up are about conflict and disgust. On the other hand when they perceive fair treatment, the areas for cooperation and planning light up.

There is a distinction between our emotional, instinctive response to a situation and our logical, deliberative consideration. Usually people's reactions to how they are treated are the result of the first type – the fast thinking – and as a society we abhor unfairness. Marsh posits that we judge people who are perceived to be unfair more harshly than we do those who act illegally.

Marsh says that managers rarely say to someone: "Get it done at any price." Rather they use subconscious, or subtextual means of pressure in which they ostensibly tell someone to perform safely but are really putting the emphasis on speed, or delivery. And eventually this will cause a collision as employees will believe they have been told that their performance outcome is more important than performing safely.

Instead we should be saying: Do it safely and by X deadline. If that can't be done, then that requires a discussion to work out how the project can be delivered safely and on time. That's a more adult, objective and effective way of dealing with people.

Marsh cited Formula One as an example of leadership responding to safety incidents properly. Following the deaths of Roland Ratzenberger and Ayrton Senna in 1994, shortly followed by the Benetton pit fire, the Formula One instituted a top to bottom review of how safety was approached and implemented. As a result the sport's safety record has gone from 1.2 fatalities every year to one life lost in the past 32 years. And all without losing any of the speed or competitiveness of racing.

See the whole presentation at drivingchange.info

Supersonic, Safely

Wing Commander Andy Green OBE is a former fighter pilot and the holder of the outright world land speed record. He told the conference how risk can be mitigated in even the most dangerous of activities.

He set the world land speed record back in 1997, driving along 14 miles of a dry Nevada lakebed. In order to claim the record and beat the US competition, veteran record-breaker Craig Breedlove, Green and his team were targeting a speed of over 700 miles per hour – and the sound speed barrier is at 750mph. So the challenge became, not just to beat the land speed record, but to do it at supersonic speeds, safely.

Green learned his approach to health and safety, for people, vehicles and teams, in the Royal Air Force. So he naturally imported his aerospace training into the land speed attempts.

"Aviation is not inherently dangerous. But to an even greater degree than the sea, it is terribly unforgiving of any carelessness, incapacity or neglect," said Captain Alfred G Lamplugh of the British Aviation Insurance Group in 1931.

Green said this quote holds true for aerospace, for his land speed record – and for driving. Not inherently dangerous but terribly unforgiving. Green believes there are large areas of commonality across all of these arenas when it comes to safety.

The first ever attempt at the land speed record featured an electric vehicle, which reached a majestic 39mph, and various attempts were made with recognisable 'cars' until the Americans started using jet- and rocket-powered cars in the 1960s. One famous example was the Budweiser Rocket car in 1979 – no gearbox, or engine, just pure thrust. No one knows quite how fast it travelled – possibly 700 mph – but (terrifyingly) the back wheels weren't in contact with the ground at that speed, so it was all moot.

Vehicle design continued to improve, but creating a vehicle which can handle the acceleration and the load, and remain stable at high speeds is extremely complex. US competitor Craig Breedlove, who had already set several land speed records, discovered to his cost that the airflows around the car could be unmanageable. During one attempt, the car flipped onto its side at 600mph and tore a massive arc through the Nevada desert – towards a bus full of schoolchildren who had come to watch.

Green's team therefore had a serious engineering task ahead of them: how to run at 750+mph and remain safe. They created a 17m vehicle with two jet engines each developing 10 tonnes of

Wing Commander Andy Green OBE

thrust. The engines at the front created the vehicle's centre of gravity, and the four-metre-wide wheelbase ensured stability.

However, the stability problem had now become a pitch problem. Drive the vehicle with the nose one degree too low and it will bury itself in the desert. One degree too high and it will generate enough lift to rip the chassis – and the driver – apart.

The solution, said former mathematician Green, is contained in the Navier-Stokes equations. Unfortunately no one has ever solved these equations, or even proved there is a solution. This, he said, is why aerospace and Formula One still do a huge amount of testing in wind tunnels, because the full mathematical solutions simply aren't available.

> ***Performance grew out of a safety focus, and delivered the first and only 750+mph world land speed record.***

The land speed record car however could not be tested in a wind tunnel, because although you can direct wind over the vehicle ay 700mph – albeit for a lot of money – you can't recreate the ground passing underneath the vehicle at supersonic speeds.

A Cray supercomputer was used to model the airflows around the vehicle at speed – but there was no way to validate its results. And without validation, they couldn't design a safe vehicle. So rather than blast wind at a stationary model of the vehicle, they instead strapped a scale model of it to a bank of air-to-ground rockets and fired it down 1.5 miles of test track. The scale model reached 800mph in 0.8 seconds – and more importantly validated the computer models about stability and airflow.

With a working model, the team could start to consider other elements of safety by design. Green warned against simply talking about driver safety – it unbalances the conversation, he said, because people respond emotionally to the idea of a colleague being hurt, and engineers were too likely to acquiesce to his demands if he framed it in terms of his personal safety.

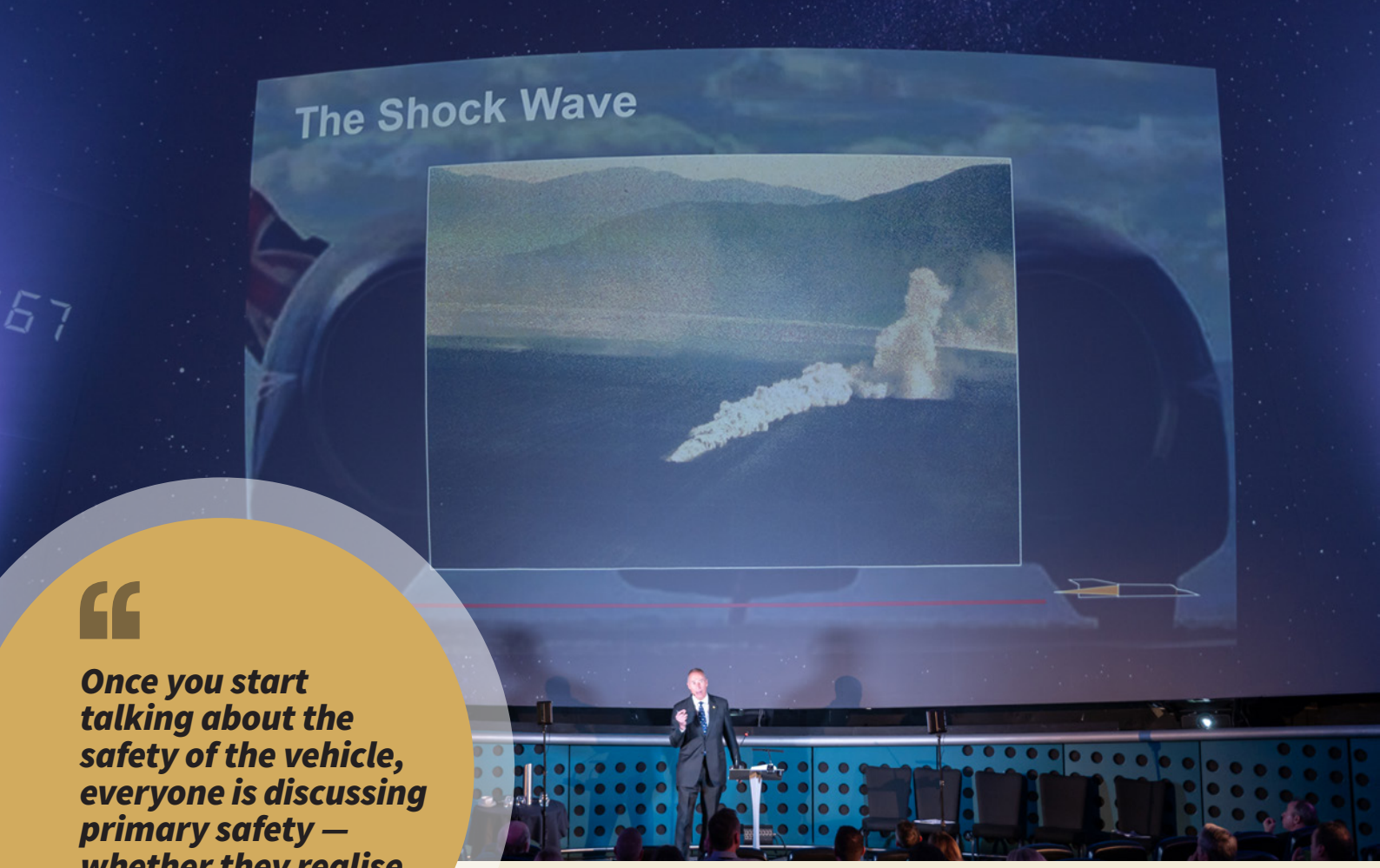
However, if discussions were framed in terms of vehicle safety, rather than just driver safety, then the engineering discussions became more objective. The whole team had to understand the consequences of getting it wrong – but they didn't need to be pressured by that knowledge in every conversation or their performance would be inhibited.

Green said there were three phases of safety: Primary safety is preventing an accident. Secondary safety is surviving the accident. Tertiary safety is being able to clean up and mitigate the post-accident aftermath.

However, although they would address secondary and tertiary safety, using the language of 'vehicle safety' ensured that everyone was focussed on not having an accident, which is the best way to keep everyone safe.

"Once you start talking about the safety of the vehicle, everyone is discussing

(continued on page 34)



Once you start talking about the safety of the vehicle, everyone is discussing primary safety — whether they realise it or not.

primary safety whether or not they realise it. So the language turned out to be an incredibly powerful part of what we did," he said.

Of the five fatal land speed attempts which have occurred, only one was potentially unlucky when a tyre blew out. In every other case, team members warned that the car was unsafe, or the car was improperly tested beforehand.

So Green's car was developed, step by step. The vehicle was regarded as a prototype and covered with sensors, and the data analysed and acted upon after each test run.

Every run had a clear profile, which detailed the context, the fuel consumption, the acceleration, the distance and every possible variable which could be predicted and planned. Every team member signed it, and Green's job was to deliver a run which matched those performance criteria as closely as possible. The team would then analyse the planned vs the actual and learn from it.

In the end they did 24 runs – an astonishing 14 of which were over 700 mph – to test their parameters as they worked up to attempting the world record.

Team structure is very important: ensure that critical safety decisions are taken by someone with all the information but sufficient objectivity not to be swept up in the enthusiasm, pressure or emotion of the event.

It's essential to learn from the past. Green talked about the NASA Challenger disaster where the engineers warned of possible failure, but the decision-making team isolated themselves and were influenced instead by political and funding pressures. To ensure the land speed record attempt did not fall into this trap, all key decisions were made by a small group, which did not include the team boss Richard Noble. This separated the financial pressures that Richard carried from the key safety decisions that the 'operations team' were making. This structure proved very effective and, on occasion, stopped the car running, allowing safety considerations to override commercial pressures to get the record.

Providing a 'psychologically safe' environment for each individual team member was equally important in the team's safety protocols. In the military, individual culpability is removed from the investigation of incidents, said Green. The purpose is not to establish blame – it is rather to learn whether the casual factors were human error, culture, training, or regulation, in order to identify what needs to be changed to prevent a similar incident happening again.

It was essential, Green said, that every single member of his team knew they were in a psychologically safe environment, with a just culture, where any mistake or concern could be flagged without penalty. He also ensured that all the team were connected with radios the entire time, so that anyone could alert him to a hazard or problem at any time.

Their land speed record attempt was successful, because it was built on assuring safety as a foundation at every stage. The team understood that the principle challenge was high-speed control of the aerodynamic forces. They used appropriate language of 'vehicle safety' to focus on keeping everyone safe. The team decision-making was kept separate from commercial and other non-safety concerns, and every member of the team was given a role in an environment of 'psychological safety'. Performance grew out of a safety focus, and delivered the first and only 750+mph world land speed record. Supersonic, safely.

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