

# Transport safety: is the law an ass?

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These are the personal views of the author and not necessarily those of the RAC Foundation or of anyone or any organisation with which he is associated.

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# 1 Context

## Scope

No transport is perfectly safe. Equipment can fail, people can make mistakes or parts of a system may be incompatible when they come together. But transport also brings many benefits. Safety regulation should ensure that the level of risk is acceptable, low enough that it is out-weighed by those benefits.

This report compares the regulation of safety risks of the four principal modes of commercial passenger transport:

- aviation, including scheduled airlines and commercial charter
- marine, including ferries and cruise liners
- rail; and
- road, including bus, coach and taxi.

It looks at the structure of safety regulation, how it is enforced and how accidents are investigated, including administrative law, for example the grant of licences, and criminal law, particularly after accidents. Civil law, such as the tort of negligence, and consequent civil claims for damages are a different subject and are not considered here<sup>1</sup>.

Some modes of transport do not fall neatly into single categories. Trams are regulated both as light rail and road vehicles and tram/trains also operate on main line railways so have to comply with heavy rail regulation. There are emerging modes of transport, such as Personal Rapid Transit (PRT), for which the regulatory framework is still to be developed.

Although some useful insight can be obtained from amateur or self-drive modes of transport (private aircraft, yachts, cars, motorcycles, cycles or walking), they are outside the scope of this report.

## Principles

Two principles are taken as axiomatic:

**PRINCIPLE 1: that transport services should provide the level of safety that society demands and for which it is prepared to pay**

This can form a logical foundation for the legal regulation of safety. For example, in *Herrington*<sup>2</sup> (a rail trespass case) Lord Diplock stated that the law:

*takes account ... of changes in social attitudes and circumstances and gives effect to the general public sentiment ...*

This judicial statement sets the agenda for this report. Chapter 2 examines how we can define *social attitudes and circumstances* and measure *general public sentiment*. Chapter 3 describes the existing regulatory

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<sup>1</sup> A paper by the author entitled "System safety and the law" examined the problems of attributing civil liability when an accident occurs as a result of a failure of a system of several independent parts. It is available at [www.pitchill.com](http://www.pitchill.com)

<sup>2</sup> *British Railways Board v Herrington* (HL) [1972] AC 877 at 941D

framework that is intended to ensure that passenger transport services deliver what is wanted. Chapter 4 then looks at the gaps, inconsistencies and deficiencies and suggest how they might be tackled.

**PRINCIPLE 2: that passengers in particular and society in general expect a very high level of safety from all modes of commercial passenger transport.**

This reflects the view often expressed in the research that is reported in Chapter 2 that passengers do not think about safety when they use public transport. They take it as given that their journey will be safe – possibly delayed, overcrowded or uncomfortable but not unsafe. But if we want to look at what this means, we encounter problems of measurement. The table below compares the level of safety risk of different modes of public transport<sup>3</sup>.

	Fatality risk per billion traveller ....		
	km	hours	trips
aviation	0.1	76	290
marine	0.6	11	32
rail	0.1	5	4
bus/coach	0.3	6	3

The different modes are not directly comparable because we use them differently, for different types of journey and for different distances. As an example, the risk per trip for air passengers looks high, partly because it is taking account of the global performance of airlines but also because, although the risk per kilometre is as low as any mode, we use aircraft for long journeys, both time and distance. Despite this difficulty, a common picture emerges that the risk of using any mode of public transport is low. Even commuters or frequent travellers are exposed to a very low risk of death or serious injury; low enough to be neglected for most day-to-day decisions.

For comparison, the self-drive modes of travel are, in general, all significantly less safe<sup>4</sup>:

	Fatality risk per billion traveller ....		
	km	hours	trips
car	2.6	100	36
cycle	32	380	120
walking	36	150	40
motorcycle	110	4300	1900

All of those figures describe the risk that arises from the transport mode itself, for example as a result of crashes, fires or other accidents. It does not include wider hazards that can be realised on the transport mode’s premises, such as terrorism and crime. Much of the concern about transport safety focuses on these security issues. The transport operators may be in the best position to deal with the hazards, in the same way as a retailer might be best able to deal with hazards that arise in a shop, but the risk does not

<sup>3</sup> sources: RSSB Annual Safety Report 2007, drawing on DfT National Travel Survey for average journey times and lengths, RSSB SRMv5.5 for rail, DfT Transport Trends 2007 over three years for bus and coach, CAA CAP763 Aviation Safety review for aviation. Marine values are an approximate estimate by the author based on DfT statistics and MAIB annual report 2007 for accidents since 1996 so do not include major passenger accidents such as the Marchioness or Herald of Free Enterprise.

<sup>4</sup> sources: as above

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arise from the transport itself. These hazards, and the regulatory framework designed to counter them, are outside the scope of this report.

## **Relevance of regulation**

It is clear from the tables comparing modes that passenger transport services achieve a high, and generally acceptable, level of safety. The companies that provide these services are all regulated to some degree to ensure that they behave in ways that should assure safety. However, the observation that they are safe is not proof that the regulatory framework is fit for purpose. It may be overly demanding, adding needlessly to cost; it may be of limited relevance if safety is driven by other considerations, such as the commercial imperative for customers to perceive the service to be safe; and it may be missing opportunities to reduce risk even further – even the low rates listed above represent many people losing their lives or being injured.

Regulation is not the only way to assure safety. The insurance sector could have a key role. Although that is not considered in this report, insurance should be part of any action to improve the regulation of passenger safety.

## 2 Measuring general public sentiment

### Analogy with other societal measurements

Academia and industry have developed many sensitive and powerful tools to measure the attitudes of society. Perhaps the best known is the opinion poll. There have been gross errors in polls but if used and analysed carefully they are surprisingly accurate. In the recent US Presidential election, a robust mathematical analysis of opinion polls carried out in advance by Gott and Colley<sup>5</sup> predicted that Obama would receive 367 Electoral College votes and McCain 171, a lead of 196. The actual outcome was a lead of 201. The power of this analysis can be seen when put beside the predictions of the bookmakers who were offering spread bets centred on a lead of 122.

“Who will you vote for?” is a simple binary choice that can be tested using opinion polls. Other more complex tools can measure attitudes to less well-defined choices, such as the potential demand for a proposed new product or support for a political policy. These tools include focus groups, deliberative conferences, Delphi studies, the Analytical Hierarchical Process and structured interviews. There are very many tools that we can invoke to measure *general public sentiment* towards transport safety.

### Passenger safety in the media

The media are another potential source of insight into societal attitudes, but, especially in the UK, offer a very poor measure. There are many examples in transport safety journalism of:

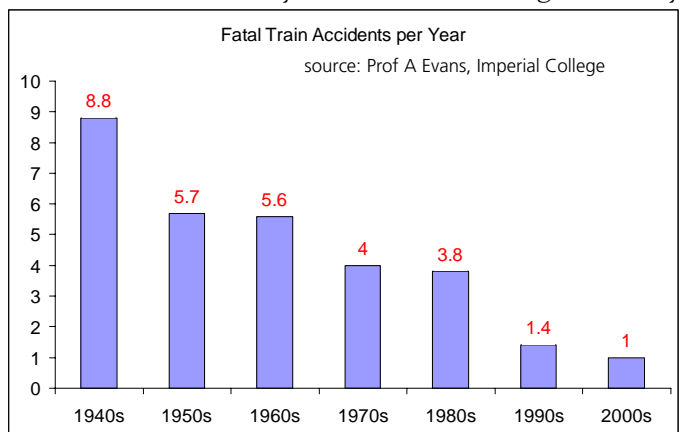
- artificially creating outrage to generate a story
- selecting evidence so that all of the statements in a report are true but the overall message is distorted
- asserting factually incorrect statements.

Two examples illustrate all of this. The first is a report on rail safety, from *The Observer*. It stated:

*The concentration of so many railway disasters – 17 in just 14 years – highlights the febleness of Britain’s current rail structure.*<sup>6</sup>

The statement is factually correct – there had been 17 fatal accidents in 14 years – but its message is wholly misleading. As well as using emotive language, such as “disasters” instead of “accidents” and “just 14 years”, the history of rail safety paints a very different picture. Only 17 accidents in 14 years highlights the strength of Britain’s current rail structure, a consequence of improvements in rail safety that had been occurring under British Rail’s stewardship and continued after privatisation.

The second is a report from the *Daily Mail* on



<sup>5</sup> Gott J R & W N Colley, “Median statistics in polling” *Mathematical and Computer Modelling* (2008) or <http://www.colleyrankings.com/>

<sup>6</sup> The Observer, 12 May 2002:

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road safety in general. Although it concerns mainly self-drive vehicles, it illustrates clearly the approach of journalists. Under the headline: **Speed camera-mad Britain losing road deaths battle** the article cited reports from European Transport Safety Council and stated:

*Britain is the speed camera capital of Europe but is fast losing the battle to reduce road deaths. The number of roadside cameras has trebled in six years while mobile speed traps set up across the country have increased 14-fold. Yet despite an unrelenting war on the motorist, Britain's record for saving lives and reducing accidents is much worse than other countries.*

*An over-reliance on cameras - at a time when fewer traffic police are patrolling the roads - has led to an alarming relative rise in drink-drive deaths. As a result, Britain has plummeted in Europe's road-safety league table. Critics say this is proof that the speed-camera policy has failed.<sup>7</sup>*

Fixed camera locations for Western Europe		Road deaths per million population	
1 Britain	4,875	1 UK	54
2 Germany	3,108	2 Norway	51.9
3 Italy	1,945	3 Switzerland	49.6
4 Holland	1,594	4 Sweden	49
5 Belgium	1,180	5 Netherlands	45

Source: Wayfinder SpeedAlert/  
The European Speed Camera Database

Source: European Transport Safety Council

Not surprisingly with such reports in the Press, the RAC Report on motoring 2008 found that “75% of people believe that speed cameras are more about raising money than safety”. But the reality is different. The ETSC reports<sup>8</sup> show that:

- out of the 30 European countries considered, the UK is ranked 5<sup>th</sup> safest. The other 4 listed in countries in the article are safer but 24 other countries have higher death rates per million population
- Britain has not “plummeted” in the road safety league; it has remained 5<sup>th</sup> out of 30 with a death rate around 50% of the European average. It is correct to say that Britain’s rate of improvement (around 1.5% per year) is worse than most other countries but that is because they have a lot to catch up
- France has the best rate of improvement (43% over 6 years) but is still 50% worse than Britain. Road safety has been a major political issue in France. The ETSC report says:

*France’s flagship measure has been the introduction of a fully automated speed management system. ... 870 fixed and mobile cameras were put in operation, and their number is still increasing*

The country that has the best rate of improvement relies on speed cameras, contrary to the message of the Daily Mail’s article. In the UK, the independent review of speed cameras<sup>9</sup> concluded that there has been a 42% reduction in the number of people killed or seriously injured at sites where safety cameras were introduced and that over 100 fewer people killed per year at camera sites

- the article is self-contradictory. It refers to the relative rise in drink-drive deaths; if the cameras are working the number of speed-related deaths will fall so the relative number due to other causes will rise.

The lecture cited other examples of that quality of safety reporting in the UK media. There are many specialist journalists who understand transport safety and report it accurately but there are also pressures to present a dramatic story and, in some cases, to use apparent safety failings to underpin a wider political message. Media reports often do not reflect true societal attitudes so cannot be relied on for valid insight into public values and, as in the speed camera example, can do much to distort public perceptions.

<sup>7</sup> Daily Mail 15 June 2007

<sup>8</sup> 1<sup>st</sup> (2006) and 2<sup>nd</sup> (2007) Road Safety PIN Report, <http://www.etsc.be/PIN.php>

<sup>9</sup> PA, University College London “National safety camera programme: Four-year evaluation report”, Dec 2005

## VPF, the Value of Preventing a (Statistical) Fatality

The VPF is a long-established tool for measuring public attitudes to safety. It is an estimate of the amount that people are willing to pay for an incremental reduction in risk, scaled to represent the amount they would pay to prevent one statistical fatality:

- a safety measure is expected to reduce the number of deaths by  $n$  over a specified time among a large population of size  $P$
- if on average each member of the population is willing to pay a sum  $v$  for the reduction in risk to themselves, total amount that the whole affected population is willing to pay for the safety measure is  $vP$
- and the willingness to pay per fatality prevented (VPF) is  $vP/n$ .

Evans<sup>10</sup> reviews the history and definition of the VPF in detail.

The Department for Transport published annually a document (HEN1) that gave the current value of the VPF, based on historical willingness to pay, corrections for inflation and change of scope and a small allowance for ambulance and hospital costs. Government policy in the UK is to apply this value to road and rail<sup>11</sup>:

*For many years we have published an annual report which sets out the value of preventing a highway fatality. That has to be taken into account by the Highways Agency and local transport authorities when they are considering road safety improvements. The current value is £1.2 million at 2001 prices per fatality saved on the roads. We think that there should be the same standards for rail safety as for road safety. That is the principle that we adopt. ...*

*There is not the same agreement with regard to aviation and shipping. Aviation is the responsibility of the Civil Aviation Authority and shipping is the responsibility of the International Maritime Organisation. They are responsible for any appraisal value for safety set by individual countries.*

VPF is a measure of public sentiment because it seeks to assess how much people are willing to pay for safety but it is at best a blunt instrument. In principle it is robust and logical but it is not easy to measure because:

- the sample of the public must be chosen to reflect the correct mix of different social groups, based on wealth, age, number of dependents and other personal circumstances, and
- the harmful events must be selected to reflect the range of different types of victim and their circumstances
- people find it very hard to attribute value to reducing what is already a very small risk. This was illustrated during the LRET lecture. The audience were asked to say how much they would be willing to pay to halve the risk of driving from London to Manchester. The general feeling was of the order of £1 (for risk reduction of 1 in 2,000,000) but they found it hard to relate to such a small risk.

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<sup>10</sup> Evans A, "Economic appraisal of road safety measures in Great Britain", 2nd International Symposium on Road Safety, Hong Kong, 5 August 2006

<sup>11</sup> Lord McIntosh of Haringey, statement in House of Lords, 5 June 2003, Hansard Column GC273



There is a strong parallel between the use of the VPF to determine how much people are willing to pay for safety and the technique used by the National Institute for Health and Clinical Excellence (NICE). NICE makes a quantitative estimate of the benefit that a treatment will provide the average patient in units of Quality Adjusted Life Years. For example, a treatment that offers an extra 2 years of full quality life would provide 2 QALYs, or a treatment that improved the quality of life from 50% of normal to 75% would, over 20 years of life expectancy, provide 5 QALYs. NICE ranks treatments in order of value for money (in pounds per QALY) and recommends that the NHS should fund all of the most cost-effective up to the limit of the budget (subject also to qualitative judgement to refine its recommendations).

NICE's approach avoids the need to attribute an absolute value to safety. Rather, it leaves the political decision as to how much to spend in total to the political process, then uses objective tools to get the most health benefit for the available resources. Despite that, there is good alignment with the VPF. NICE's threshold is of the order of £30,000 per QALY. If one assumes that a person killed in a road or rail accident had around 50 years to live, the value is similar to the VPF.

## Measuring attitudes to transport safety – rail experience

### *Origins*

The safety of the GB railway came under intense media and political criticism in the late 1990s, much of which reflected the weaknesses of transport journalism rather than lack of safety. This pressure, and the realisation that the newly privatised industry needed a better rationale for decisions than had been needed by publicly-owned BR, led to the Rail Safety and Standards Board (and its predecessors) conducting a Safety Decisions Programme to improve the understanding of how railways should take decisions that affect safety. That programme informed two major statements of principle: “How safe is safe enough?”<sup>12</sup> and “Taking safe decisions”<sup>13</sup>.

The underpinning research for those documents is probably the most exhaustive examination of the methods that can be used to characterise general public sentiment towards transport safety. It provides insight into what can be measured and how people feel that might be applicable more widely to other modes of transport. The tools used in that programme are summarised below, with a link to the report that sets out the method in detail and its conclusions.

### *Psychological studies*

*The nature of public beliefs concerning rail accidents in Britain*, April 2004, commissioned by RSSB but unpublished. This involved an extensive programme of semi-structured, depth interviews to understand people's thinking and beliefs, analysing unprompted thoughts of participants concerning the rail industry in general as well as the specific issues of interest. Interviews were recorded and transcribed then analysed by psychologists, synthesis was by an academic philosopher.

This project emerged from a broader review of the topic, see “Railway safety and the ethics of the tolerability of risk”, October 2002, T230b at <http://www.rssb.co.uk/research/allsearch.asp>

<sup>12</sup> <http://www.rssb.co.uk/pdf/reports/how%20safe%20is%20safe%20enough%20-%20executive%20summary.pdf>

<sup>13</sup> [http://www.rssb.co.uk/safety/safety\\_strategies/sdmoukr.asp](http://www.rssb.co.uk/safety/safety_strategies/sdmoukr.asp)

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### **Focus groups**

In order to test their effectiveness, two focus groups were recruited in different parts of the country (one a commuter area, one less train-dependent) and each met twice. After the first session they were given some information on the rail industry and safety to read before the next session. The process was very effective; the lay groups quickly grasped the issues and trade-offs in safety, had a thoughtful debate and made helpful and insightful comments with realistic conclusions.

Horlick-Jones T, *Reasoning about safety management policy in everyday terms: a pilot study in citizen engagement for the UK railway industry*, 1 January 2008, Journal of Risk Research, <http://dx.doi.org/10.1080/13669870701875693>

### **Deliberative conference**

The Health and Safety Executive sponsored several events including an Experts' forum, workshops with the public and a deliberative conference of delegates from the workshops and experts, all in order to inform thinking on future rail safety legislation and investments. A common conclusion was that transport safety was not a high priority; people often had to be prompted before safety arose as a concern. The overall outcome was again that there was a consistent and sensible debate.

Dyball M & S King, *Public dialogue on train protection*, HSE Research Report 055, 2003, <http://dx.doi.org/10.1080/13669870701875693>

### **Pairwise comparisons**

A set of accident scenarios were defined and many individuals and groups were asked to score their relative severity, taken in pairs. So for example a tunnel accident might be thought to be much worse than a derailment, a passenger death slightly worse than a worker death and a fatal accident to a trespasser less serious than to a worker. A consistent picture emerged across different pairs and between different groups of people.

This is similar to the process used in Saaty's Analytic Hierarchy Process to capture underlying understanding in a semi-quantitative manner.

ORRA, *Assessment of the Value for Preventing a Fatality*, T616 at <http://www.rspb.co.uk/research/allsearch.asp>

### **Interviews**

Semi-structured anonymous interviews were conducted with politicians, religious leaders, people with first hand experience of rail accidents and opinion formers. The interviews were analysed and the results summarised in the published report.

Elliott C J and T Taig, *Ethical basis of rail safety decisions*, March 2003, T230a at <http://www.rspb.co.uk/research/allsearch.asp>.

### **Scenario assessment**

This built on earlier work sponsored by HSE to characterise society's concerns about safety. The project started by identifying the key axes on which to measure concern and then used focus groups to score each of several different scenarios, eg child fatality, chemical spill. The axes are:

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1. consequences are large per accident
2. consequences are fearful
3. consequences are likely either in general or specifically to the person being asked
4. consequences are unfair
5. victims lack personal control over the risk
6. industry is to blame or its actions are somehow shameful
7. industry can not be trusted to deal with the risk

The groups were not random but made up of people who might be expected to have a similar outlook. Again there was strong consistency across different groups, although a group drawn from the rail industry differed in its judgement from the others.

Risk Solutions, *Development of a model for gauging societal concern for the railway industry*, March 2004, T224 and T517 at <http://www.rssb.co.uk/research/allsearch.asp>.

## Other research

DfT sponsors research into public attitudes across modes, although not unexpectedly it concentrates primarily on road transport. See for example:

- GfK NOP, Public Attitudes to Transport, DfT's On-line Citizens' Panel, June 2008, <http://www.dft.gov.uk/pgr/scienceresearch/social/citizens.pdf>
- University of the West of England, Public attitudes to transport: Knowledge review of existing evidence, June 2008, <http://www.dft.gov.uk/pgr/scienceresearch/social/evidence.pdf>.

## Principal results and messages

A clear picture emerges from the results of the rail research, reinforced by DfT's and HSE's projects. The single most important point is that it is possible to have a constructive debate about safety and to capture – qualitatively and quantitatively – what people believe and demand. Furthermore, we (this is about us, not “people” in the abstract) are sensible and realistic:

- resources are limited, safety spending can be a bottomless pit, someone has to balance costs and risks (but it's very difficult to talk about the safety of “your child”)
- there should be a proportionate response, not “safety at all costs”
- we don't weight one cause more than another – eg a death in a fire or in an accident in a tunnel is no worse than in an impact accident
- we don't weight multiple death accidents more than single – eg an accident in which 3 people die is no worse than 3 accidents in which one person dies
- we don't weight a death that is in part self-inflicted as highly as a passive death – eg a trespasser is less important than a passenger or worker. (This research did not investigate the relative weight attached to different types of victim – for example, young or old, an issue with which NICE has grappled - in part because the hazards do not differentiate between types of victim).

It looks very much as though society takes a utilitarian view, being pragmatic and realistic. However, we do not go as far as Bentham's concept of utilitarianism, which is that the ethically right course of action is the

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one that leads to the greatest happiness and least pain so the motive does not matter, only the outcome. The research highlights a clear ethical duty to be competent:

- a dutyholder should not argue that a safety measure is too expensive if the reason is that the dutyholder is not efficient. This was put to the author bluntly by the parents of one of the people killed in a train accident. They were understandably calling for expensive safety measures and, when asked how these should be paid for, said “*the railway can't say it can't afford them when it's pissing money down the drain*”
- poor service undermines trust. One of the focus group participants said “*if they can't keep the train clean, is it safe?*”
- people expect safety when buying a ticket and have rising expectations – modes of transport that are already very safe create an assumption that they will be perfectly safe.

We appear to be able to sustain two simultaneous views: as consumers we will tolerate accidents but as citizens we are outraged by blameworthy behaviour and incompetence. This does not mean that there is great appetite for criminal prosecution of transport operators who have accidents. Rather, it suggests that an accident that is perceived as avoidable is more damaging to society than one that is seen as being no-one's fault.

Behind all this is the principle that the informed opinion of the general public could and should drive policy and hence regulation. There is sound democratic support for this concept. Thomas Jefferson wrote:

*I know of no safe depository of the ultimate powers of the society but the people themselves, and if we think them not enlightened enough to exercise control with a wholesome discretion, the remedy is not to take it from them, but to inform their discretion by education.*

## 3 Regulatory frameworks

### Structure of law

Before diving in to the details of the legal structure that regulates passenger safety, it might be helpful to summarise some basic legal principles. The Oxford English Dictionary defines law as:

*the body of rules, whether formally enacted or customary, which a state or community recognises as binding on its members or subjects...*”

In practice:

- regulation is by principles and practice; both the laws themselves and the way in which they are enforced
- the rules can arise from anywhere (Parliament, international agreements, private agreements, previous court decisions); the important test is whether the state will enforce them
- this report is concerned with English law, as applied in the UK. Other common law jurisdictions, such as the USA and Australia, have a similar approach and broadly similar principles would apply throughout the world but the details may be significantly different from the UK law.

The opening premise of this report was that all modes of transport put their passengers' safety at risk. The state uses the law to authorise actions that would be unacceptable but for their benefits to society, so regulates the behaviour of passenger transport operators. Three kinds of law are important for this:

- civil law – this regulates the relationship between individuals. For transport safety this includes the law of negligence, which applies when a duty holder's behaviour falls below the standard of a reasonable person and harm is caused as a result. The negligent duty holder is liable to pay compensation to right the harm, as retribution not punishment. Civil law is largely the same for transport as for any other activity so is not explored further in this report
- criminal law – this defines duties imposed by the state on all of its citizens. For transport safety we are particularly concerned with manslaughter (corporate or individual) and the Health & Safety at Work Act. Breaching the criminal law self-evidently is a crime which may be punished, usually by a fine or imprisonment.
- administrative law – this regulates the behaviour of the state and state-licensed bodies. It is often the primary way in which safety is regulated.

Three questions follow for each of the principle modes of passenger transport: aviation, marine, rail and road.

- how is safety regulated and how are the regulations enforced?
- how are accidents investigated?

## Regulatory frameworks – regulation and enforcement

### Aviation

Aviation safety is regulated largely by a set of prescriptive rules, rooted in the 1944 Chicago Convention. The International Civil Aviation Organisation (ICAO) establishes the minimum standards that must be achieved by all countries and operators, and national or regional rules may be defined that exceed the global standards. In addition, bilateral Air Service Agreements exist between every pair of countries that share an air service.

The prescriptive rules apply to people and equipment; every organisation and person with a safety role is licensed, every aircraft is subject to a Design Authority.

In the UK the Civil Aviation Authority (CAA) issues licences and monitors compliance with the rules. It has a strong force of skilled inspectors who monitor all licensed organisations and people. ICAO audits CAA and all other states' safety authorities.

The regulatory system relies on all parties being open, cooperative and willing to comply with the standards. This in turn demands a spirit of mutual trust. CAA has the power to enforce by persuasion and if necessary suspending or revoking a licence. It resorts to criminal prosecution only if the failing was wilful or deliberate. However, there is increasing pressure on all aviation regulators for more criminal prosecutions<sup>14</sup>. This is seen as potentially very damaging and could reduce safety. The US' Flight Safety Foundation, the UK's Royal Aeronautical Society, the French Academie Nationale de l'Air et de l'Espace and four other organisations issued in November 2006 a joint five-point resolution<sup>15</sup>, summarised in its accompanying press release as:

*... decrying the increasing tendency of law enforcement and judicial authorities to attempt to criminalise aviation accidents, to the detriment of aviation safety.*

### Marine

Marine safety regulation is also founded on international prescriptive agreements, such as the SOLAS (Safety of Life at Sea) Convention, the Loadline Convention, certification of watchkeepers and the International Ship Management Code, all operated within the ambit of the International Maritime Organisation (IMO), a UN body. Each state that licences merchant vessels transposes the conventions into national law and requires that compliance is verified by an independent Classification Society. Commercial enforcement is also imposed by the insurance companies that also require all vessels to be in class; that is, verified as compliant by a Classification Society.

Criminal prosecution following accidents is rare, at least at present and where the accident has only safety and not environmental consequences. There is however growing pressure for further regulation, at present driven primarily by the environmental consequences of an accident. For example, the recent EU Directive 2005/35<sup>16</sup> criminalises accidents that arise *with intent, recklessness or by serious negligence* and the potential defendants include the Classification Society that classified the vessel<sup>17</sup>. It was commented during the

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<sup>14</sup> see for example Thomas, G, "A crime against safety", Air Transport World, January 2007, p.57

<sup>15</sup> [http://www.flightsafety.org/pdf/resolution\\_10-06.pdf](http://www.flightsafety.org/pdf/resolution_10-06.pdf)

<sup>16</sup> Directive 2005/35/EC of the European Parliament and of the Council of 7 September 2005 on ship-source pollution and on the introduction of penalties for infringements

<sup>17</sup> Ibid Recital 7

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research for this lecture and report that the maritime industry fears a witch-hunt leading to “criminalisation of seafarers”.

### **Rail**

Safety regulation of rail is complex, involving compliance both with prescriptive rules and goal-setting legislation. It is an industry in transition, shaking off a 19<sup>th</sup> century craft culture and replacing it with a 21<sup>st</sup> century management culture. The prescriptive rules are now harmonised at a European level as Technical Specifications for Interoperability, verified by independent Notified Bodies. The goals come from the duty imposed by the Health and Safety at Work Act (HSWA) to reduce risk so far as is reasonable practicable, verified either by a Competent Person appointed by the duty holder or self-verified. Operators within the EU must have a Safety Management System that complies with a set of general principles and is accepted by the state as part of licensing.

HSWA is the legal basis for most railway safety law. This is somewhat illogical, since it regulates rail companies in their capacity as employers, not as transport operators. That approach is appropriate for the safety of workers and passengers within a workplace (carriage, maintenance depot) but not for regulating a system because it does not address interactions between players. Also, it is uncertain and subjective. There are further difficulties with applying HSWA to a hybrid public/private structure, such as the question as to whether affordability is relevant to reasonable practicability. HSWA was the product of the Robens report in 1972, which specifically recommended that its otherwise highly effective principle that duty holders must each do all that is reasonably practicable should not apply to transport:

*... Provisions for the safety and health of those engaged in flying aircraft, driving trains, lorries and so on clearly cannot be considered in isolation from a whole complex of special considerations such as the constraints imposed by the design of transport vehicles, the circumstances in which they operate which include many eventualities beyond the control of an employer; ...<sup>18</sup>*

The section on “Transport workers” concludes that the proposed general occupational safety and health provisions should extend to:

*... all transport workers except whilst they are directly engaged on transport operations.<sup>19</sup>*

Robens never intended that the legislation that he was designing should be used to regulate passenger safety.

The Office of Rail Regulation as National Safety Authority issues licences (certificates or authorisations) and has force of Inspectors to monitor duty holders’ compliance. It in turn is audited by the European rail Agency. ORR has a hierarchy of responses to breaches from warning (a former Chief Inspector used to refer to delivering a “statutory bollocking”) through Enforcement and Prohibition Notices to prosecution using HSWA powers. Although ORR is sensitive to the potentially harmful effects of excessive use of criminal prosecution, it is not the only prosecutor and the Crown Prosecution Service also brings HSWA prosecutions when it believes that this is in the public interest.

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<sup>18</sup> “Safety and Health at Work”, Cmnd. 5034 July 1972, Vol 1, para 182

<sup>19</sup> *ibid* para 184

## Road

Bus and coach services are licensed by traffic commissioners<sup>20</sup> who must satisfy themselves that the operator has: good repute (few criminal convictions for serious offences), good financial standing (in practice capital of at least £5000 per vehicle) and professional competence (at least the transport manager holds an appropriate certificate). Safety is not explicitly considered.

Vehicles are subject to exhaustive prescriptive regulations, type approval and annual testing but there is limited regulation of drivers, even though most accidents are at least in part as a result of driver error<sup>21</sup>. Until 2008, drivers were only required to have passed a driving test. Recent regulations<sup>22</sup> also require drivers to hold a Certificate of Professional Competence that includes theory and practical tests and at least 35 hours training every 5 years. They do not however require retesting – vehicles are tested every year but drivers only once at the start of their careers.

Safety regulations are enforced using roads legislation. This is based in criminal law; the action after an accident is to seek a criminal prosecution. However, prosecutors rarely charge drivers with manslaughter. Defendants whose actions are alleged to have caused a fatality are charged with causing death by dangerous (or careless) driving, which usually carries lighter penalties than manslaughter would. This is surprising; higher penalties might be expected because the Courts should take into account *the risk inherent in what was being done of really serious injury or death, and the extent to which this must have been apparent to those involved*<sup>23</sup>.

## Comparison of regulatory frameworks between modes

Even this superficial summary of the legal frameworks for regulating passenger safety and the mechanisms for enforcement show variations between modes, including: the role of the state, the use of private safety assessors, licensing of workers and the degree of prescription.

Aviation, marine and rail are all subject to common international standards derived from treaties or conventions and are to various degrees prescriptive:

- aviation is highly prescriptive and subject to enforcement by state bodies that are themselves overseen by international organisations. Licensing of people and organisations is key; there is even pressure to license cabin crew.
- marine is less prescriptive and enforced by private organisations that are recognised by states and the international bodies but chosen or paid by the ship owner. This could invite “class shopping”, where the owner chooses the Classification Society most likely to give it an easy time but this risk is present in any independent audit and is one against which the responsible Classification Societies are constantly vigilant. It has to be balanced against the strength of a competitive market that encourages research and innovation. Some safety-critical roles are subject to licensing but it is less widespread than for aviation.
- rail is a mixture of prescription and local optimisation. The trend is towards greater prescription, in order to allow interoperability which both strengthens the market for supply of equipment and allows trains to run seamlessly across borders. Enforcement is changing, historically having been by state

<sup>20</sup> Public Passenger Vehicles Act 1981

<sup>21</sup> <http://www.rospa.com/roadsafety/advice/motorvehicles/policy/preventaccidents.htm>

<sup>22</sup> Vehicle Drivers (Certificates of Professional Competence) Regulations 2008

<sup>23</sup> [http://www.cps.gov.uk/legal/s\\_to\\_u/sentencing\\_manual/involuntary\\_manslaughter/](http://www.cps.gov.uk/legal/s_to_u/sentencing_manual/involuntary_manslaughter/)



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employed inspectors but increasingly by independent companies (some of whom are divisions of the Classification Societies in the marine sector). Formal licensing of individuals is rare, although an EU system for driver licensing is being introduced, track work supervisors are accredited and professional bodies accredit for example signal engineers.

Road transport is significantly different from the others, probably because passenger transport services share infrastructure with self-drive vehicles so fit within their regulatory framework. Type approval of vehicles is increasingly prescriptive and harmonised, at least within the EU, but the human side of safety, including safety management, is only loosely defined.

It is hard to see any justification, other than historical accident, for the modes being treated differently since they have much in common. Not only do they all expose their passengers to risk, they all benefit commercially from standards to allow smooth interoperation and they all operate internationally.

## Regulatory frameworks – accident investigation

Independent accident investigation organisations exist within the Department for Transport (DfT) for the aviation, marine and rail modes. Their roles are defined by statute.

### ***Air Accident Investigation Branch***<sup>24</sup>

*4 The fundamental purpose of investigating accidents under these Regulations shall be to determine the circumstances and causes of the accident with a view to the preservation of life and the avoidance of accidents in the future; it is not the purpose to apportion blame or liability.*

### ***Marine Accident Investigation Branch***<sup>25</sup>

*5. (1) The sole objective of the investigation of an accident under these Regulations shall be the prevention of future accidents through the ascertainment of its causes and circumstances.*

*(2) It shall not be the purpose of an investigation to determine liability nor, except so far as is necessary to achieve its objective, to apportion blame.*

...

*13 (9) If any part of the report or analysis therein is based on information obtained pursuant to an inspector's powers under sections 259 and 267(8) of the Act, the report shall be inadmissible in any judicial proceedings whose purpose or one of whose purposes is to attribute or apportion liability or blame unless a Court or tribunal, having regard to the factors mentioned in regulation 12(5)(b) or (c), determines otherwise.*

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<sup>24</sup> Civil Aviation (Investigation of Air Accidents) Regulations 1989

<sup>25</sup> Merchant Shipping (Accident Reporting and Investigation) Regulations 2005

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### **Rail Accident Investigation Branch<sup>26</sup>**

4 In exercising their functions the Rail Accident Investigation Branch shall, wherever relevant, aim (a) to improve the safety of railways, and (b) to prevent railway accidents and railway incidents.

...

7 (5) In performing a function in relation to an accident or incident the Branch (a) shall not consider or determine blame or liability, but (b) may determine and report on a cause of an accident or incident whether or not blame or liability is likely to be inferred from the determination or report.

### **Road**

Road accidents are investigated by the Police. Although they may have considerable expertise, their primary objectives are to collect evidence that might be used in a subsequent criminal prosecution and to re-open the road. Their remit is not to find out the underlying causes and there is no obvious mechanism by which, even if they did, they could influence the design of vehicles, roads or future regulation.

A tragic example of this weakness was the accident on the M6 in October 2008 in which a family of 6 was killed when a truck ran into their stationary car. The immediate cause of the accident was a lapse of concentration by the truck driver who, although described by his employer as “an exemplary employee”, was charged with causing death by careless driving and sentenced to 3 years imprisonment, but was his lapse the root cause of the accident? Motorways are very safe when traffic is flowing smoothly; when it is perturbed a single lapse can lead to tragedy. It is arguable that the root cause of the accident was an earlier accident on the same section of motorway that caused the traffic jam in which the car was stopped. It is not clear whether this could have been cleared more quickly if, for example, there had been no pressure to investigate possible criminal offences so no-one, not even the Coroner, is in a position to draw informed conclusions on root cause.

The Secretary of State for Transport has power to order an inquiry but rarely does so:

*Where an accident arises out of the presence of a motor vehicle on a road, the Secretary of State may direct inquiry to be made into the cause of the accident<sup>27</sup>*

The Health and Safety Executive has the expertise to carry out accident investigations and road accidents involving passenger transport services occur in the course of employment and therefore are subject to HSWA and within HSE's remit. However, its policy states:

*Current priorities, as set out in HSC's Strategic plan, do not include work-related road safety.<sup>28</sup>*

### **Comparison of accident investigation between modes**

The disparity between accident investigation in the different modes of passenger transport is striking. Three modes have an independent accident investigation branch with terms of reference that require it to investigate cause, not blame. However, the world's leading independent aviation safety authorities found it necessary to issue their joint statement decrying the attempt to criminalise aviation accidents instead of seeking to prevent future accidents, and marine and rail operators share their concern.

<sup>26</sup> Railways and Transport Safety Act 2003

<sup>27</sup> s180 (1) Road Traffic Act 1988

<sup>28</sup> HSE “Driving at work: Managing work-related road safety” <http://www.hse.gov.uk/pubns/indg382.pdf>

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There is also a significant difference between the modes if the investigation does indicate blame. Marine investigations may not be used in court proceedings. This was illustrated in the prosecution of the watch officer of the *Pride of Bilbao*, charged with manslaughter after the yacht *Ouzo* was apparently struck by a ship and its crew of three killed. He was acquitted, in part because the prosecution could not prove which ship had hit the *Ouzo*. The MAIB report, which established that the tracks of the *Pride of Bilbao* and of the *Ouzo* did coincide, was not published until a few hours after the jury returned its verdict. The legislation establishing the RAIB expressly takes the opposite approach, allowing its reports to be used, and that for AAIB is silent on the issue. There are arguments for both approaches – preventing publication may make witnesses more willing to help the inquiry to find cause, allowing it may advance justice in criminal proceedings – but they cannot both be right.

Road accidents are hardly investigated at all. Compare the investigation of two accidents. In both cases one passenger died and the second Principle of this report is that we expect a very high level of safety from all modes of public transport. The investigation of the Grayrigg rail accident<sup>29</sup> (18 months work, 250 page report, 29 recommendations) considered other similar accidents and identified systematic weaknesses. There was no investigation of the underlying cause of the Alton Towers bus crash in August 2008, even though locals had been campaigning for years about the inadequate roads and sharp corners<sup>30</sup>. No lessons have been learnt, no systematic causes eliminated. Criminal sanctions against road drivers clearly are not enough. We have been imprisoning, fining or banning from driving those who are the immediate cause of road accidents for almost 100 years but they still kill around 3000 people each year in the UK, around 50,000 in Europe and around 1 million globally.

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<sup>29</sup> [http://www.raib.gov.uk/publications/investigation\\_reports/reports\\_2008/report202008.cfm](http://www.raib.gov.uk/publications/investigation_reports/reports_2008/report202008.cfm)

<sup>30</sup> see for example <http://news.bbc.co.uk/1/hi/england/staffordshire/7569413.stm>

## 4 Implications and action

### Messages for passenger safety regulation

The regulation of passenger safety is confused:

- it is a mixture of prescriptive standards and aspirational goals, with little consistency within or between modes
- much is a consequence of historical accident, driven as much by the mood of the times in which the mode emerged as by logic. For example, railways emerged during “gung-ho” economic growth of Victorian times so were permitted practices that would be unacceptable if proposed today whereas aviation emerged in the more sober 1930s and 1950s and was the privilege of the rich who demanded high levels of safety from the start
- it is often strongly influenced by the political need to be seen to do something after a major accident. “*This must never happen again*” drives legislation which at best locks the stable door after the horse has bolted and at worst detracts from safety by diverting effort or even introducing a higher risk activity to eliminate the immediate concern
- much regulation is derived from international standards which are often the result of political horse trading. It is then embellished by national extensions
- political and media priorities appear not to coincide with true public concerns and values
- a dogmatic belief in criminal prosecution of those who are the immediate causes of accidents does not reflect public attitudes and can obstruct the process of finding the true cause and preventing repetition. More seriously, it can encourage “defensive management” where the operator acts to minimise the risk of prosecution rather than to maximise safety, a process analogous to the more widely known defensive medicine<sup>31</sup>

Despite all this, most passenger transport achieves a high level of safety. This implies that safety regulation is inefficient; more rational regulation should be able to deliver the same level of safety at lower cost, whether that cost is in money or loss of service in order to comply with inappropriate safety regulations.

### System failures

The weaknesses of concentrating on the immediate causes of accidents, often with a view to a prosecution, can be illustrated with four examples, one from each mode. In each case it is clear that blaming the person immediately responsible is unjust and fails to identify the cause so as to prevent the accident recurring. It also fails to recognise that some accidents arise as a result of incompatibility between two organisations or systems.

#### **Aviation – Überlingen**

The Überlingen accident occurred when two aircraft were approaching over Switzerland. The automatic warning systems (TCAS) activated correctly and told the TU154 to climb and B757 to dive. The air traffic

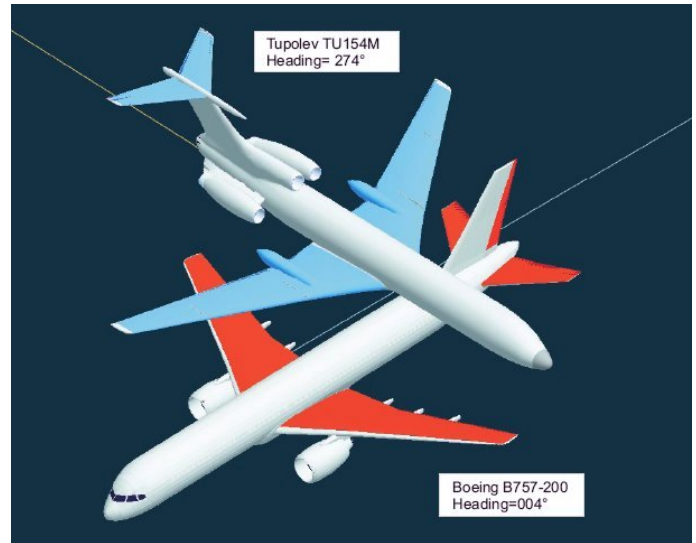
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<sup>31</sup> see for example <http://www.bmj.com/cgi/content/abstract/310/6971/27> or <http://www.medterms.com/script/main/art.asp?articlekey=33262>

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controller also intervened, telling the TU154 to dive. That pilot chose to obey the controller. 71 people died and the accident was especially tragic because most the passengers on the TU154 were children.

On the face of it, this was a simple controller error. Four members of the air traffic control organisation were subsequently convicted of manslaughter (the front line controller was not charged because he had already been murdered by a relative of three of the victims). But the real causes were much more complex, including a failure of the international community to define appropriate protocols for TCAS, inadequate or non-functioning equipment in the control centre and a failure of the European regulatory body to enforce its own harmonised standards<sup>32</sup>.



### ***Marine – Herald of Free Enterprise***

The facts of the sinking of the Herald of Free Enterprise are well known – she left Zeebrugge harbour with the bow doors open, sea entered the vehicle deck causing the ship to list and become unstable. The immediate cause is obvious – motoring into a rough sea with an open front. But the underlying cause is much less simple. It includes the corporate and professional culture that allowed this practice, the pressure to keep to timetables and the design of the vessel, in particular the vehicle deck.

### ***Rail – Ladbroke Grove***

The Ladbroke Grove rail accident occurred when a driver failed to see a red “stop” signal and took his train across the path of a high speed train. 31 people died in the resulting collision. On its face the cause is simple, and the driver’s employers were convicted of breach of HSWA.



<sup>32</sup> Brooker P, The Überlingen accident: macro-level safety lessons, Safety Science 2007

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But the underlying causes were much more complicated. The signal was one of many on a single gantry, hard to locate especially when illuminated by strong low angle sunlight. It had been passed several times before; experienced drivers knew it was hard to see and drove slowly through that section. The prevailing regulations required all signalling schemes to be approved by the safety authorities; this one had been operating with a derogation without approval for many months.

### **Road – Camden railway bridge**



Although fortunately no-one was killed, this accident again illustrates the complexity of underlying causes. The bus was on a diversionary route following the Camden Market fire in 2008. It is clear from the picture that the bus has to go through the centre of the arch, so on its face is just a driver error. But this was, like many accidents, a result of perturbed operations. It was not the normal route taken by the driver and requires special precautions and training. It was a failure of management as well as the driver.

### **Common feature of all four accidents**

In all four of the examples, the underlying cause of the accident is much more complex than the failure of an individual or component. They occurred because of failings by management, institutional culture, regulatory oversight or international coordination. The regulatory framework has to address these as well as the behaviour of front-line individuals.

## **Action to improve regulation of passenger safety**

This report asked if the law that regulates passenger safety transport safety is “an ass” The evidence is that it is not, in that it does not have the perverse and irrational structure that Dickens’ character described, but it is confused and inconsistent (the term “dog’s breakfast” was used in the lecture):

- political and enforcement actions are too often driven by hysterical press, not considered analysis
- there is increasing pressure to focus on punishing individuals and not on identifying and rectifying systemic failings
- principles and practice vary greatly between modes of transport, often because of historical accident and with little logical basis.

In the speech on VPF referenced earlier, the Minister said:

*If you have lost a loved one, it does not matter whether that occurred in a road, rail or aviation accident.*

We need two actions. The first is research to develop a clear understanding, supported by evidence, of general public sentiment – what people, when properly informed, want from transport safety. The railway work described in section 2 of this report shows that this is possible; it needs to be extended across modes. The second is then a “first principles” review of transport safety law, aiming to make the same radical rationalisation as the Robens report did for the mess of industrial safety law that existed until the 1970s.

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That review should address three questions:

- what should the regulatory regime look like, across all modes of public transport including those that are emerging for the future?
- what can we do in the UK to bring it about?
- whom should we influence outside the UK and how?

The over-riding objective is clear: **we should work towards a legal regime that delivers the level of passenger safety that people want and are prepared to pay for – consistent, fair and enforceable, driven by prevention not punishment.**