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THE UK RAIL INDUSTRY 1993-2000: A CASE STUDY OF RISK MANAGEMENT ACROSS THE PUBLIC – PRIVATE SECTOR INTERFACE

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September 2002

UNIVERSITY OF SOUTHAMPTON

ABSTRACT

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The research examines the utility of the scientific perception of risk in the context of the experience of the UK Railway system between 1993 – 2000; a period that saw the fragmentation of the industry as the privatisation process come to fruition. Particular attention is paid to the utility of Quantitative Risk Assessment techniques, such as Cost benefit Analysis in identifying and informing decisions about risk, in the newly open system that characterised the Rail industry in this period. In this, regard is taken of Charles Perrow's theories about the inevitability of accidents in systems that are complex and which use advanced technology; an inevitability that leads him to conclude that they are 'Normal' accidents. The conclusion is that in the complex and interdependent industries such as the privatised rail industry, such techniques have proved inadequate and inappropriate, due to institutional and organisational failings.

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Acknowledgements

The author wishes to make acknowledgements to a number of a people and institutions. Firstly, to the ESRC and the School of Management at Southampton University for giving me the chance to undertake a project that first began to germinate in 1996. Also to the libraries of both Southampton University and Southampton Institute. Thirdly to all the people and institutions who I contacted as part of my research. All of who, with the single exception of politicians gave their time gladly and responded to my questioning patiently. Fourthly to my supervisor, whose advice and good humour sustained me through difficult times. Lastly as ever, to Elizabeth.

Definitions and Acronyms

ATP: Automatic Train Protection

AWS: Advanced Warning System

BTP: British Transport Police

GWT: Great Western Trains

HMRI: Her Majesty's Rail Inspectorate

HSAWA: Health and Safety at Work Act

HSC: Health and Safety Commission

HSE: Health and Safety Executive

HST: High Speed Train

RGSs: Rail Group Standards

RII: Rail Internal Inquiry

RSCs : Rail Safety Cases

SPAD: Signal Passed At Danger

TOC: Train Operating Companies

TPWS: Train protection Warning System

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Introduction

This thesis will examine the utility of the approach to risk management currently practised in the UK Rail industry in the light of Charles Perrow's Normal Accident Theory. Specifically it will argue that the strategies adopted in the newly privatised industry have been nullified by the systematic complexity introduced into the industry as a result of the privatisation process. A secondary theme will be to examine how the process has created a situation where decisions on risk have been effectively contracted out to operators and experts, in the form of regulators and academics.

This is evinced by the formulation and adoption of the safety case approach to risk management - a process which is the result of negotiation between operators and regulators – to the effective exclusion of all others. Associated with this, is the adoption of the Quantitative Risk Assessment, QRA, approach which purports to present risk in an objective and scientific manner, that cannot rationally be challenged.

Specifically, the thesis will consider how privatisation of the rail network has impacted on systemic complexity. Following from this, there will be an examination of the relative utility of external regulation, in the light of sociological theories of risk, which sees the occurrence of major incidents as functions of socio-technical failures in organisational settings.

To achieve this the thesis will outline the way risk management in the UK Rail industry changed and developed in the years leading up to, and immediately following privatisation in 1993-1996.

Risk Management and the Railways

The transition to public ownership of the former 'British Rail', was one of the last great acts in a process of privatisation began under the Conservative Government of 1979. This process manifested itself in a number of ways including outright sales and flotations, such as British Telecom and British Gas, but also in the growth of 'Next Step' Agencies attached to Central Departments in Whitehall. Thirdly, there was a growth in the number of QUANGOs to take over what had previously been departmental responsibilities.

All these aspects of change were to occur in the rail industry with train operating services franchised out and the infrastructure provider, Railtrack, sold off. Additionally, the way the industry was regulated was taken from the Department of Transport and devolved to such bodies as the ORR; OPRAF (now SRA); and the HSE, (see Chapters 3 & 4). It should however be noted that privatisation was only the logical conclusion to developments within the industry that occurred over a 20 year period from the early 1970s onwards.

Thus British Rail underwent a managerial revolution that replaced the primacy of the engineering ethos with one where business and financial considerations were pre eminent, (Chapter 3).

As with other acts of privatisation, the process proved to be controversial, with issues such as pricing policy and delivery of services, attracting wide attention and comment. [1]What wasn't debated as extensively was the effect the change in structures and ethos that accompanied

[1] For Example RPC reports and the 'Which' report *'Off the Rails'*, January, 1999.

privatisation had on how risk management was conducted and how safety was delivered. Rather it was left to industry experts to decide to adapt risk management techniques and structures from the nuclear and oil industries. This involved giving prominence to the Safety Case regime which stresses a management systems approach to risk and safety. Also there was an attempt by regulatory authorities and Railtrack, as the infrastructure provider in the new system, to standardise risk assessment techniques with the use of Quantitative Risk Assessment, QRA.

Consequent to this responsibility for making decisions on risk was increasingly distanced from elected politicians.

The utility and appropriateness of such developments will be examined in terms of existing socio-technical theories, which developed in the 1980s and 1980s to challenge the scientific perspective of risk, (Royal Society, 1992; Horlick Jones, 1996 etc). However, unlike for example Turner, (1978), the research won't be focused so much on establishing the causation of individual disasters, in order to demonstrate the appropriateness of the Turner-Toft model. Rather, it will establish the principal of organisational complexity in the rail industry in terms of Perrow's theory, 'Normal Accidents', (see Chapter 2).

Normal Accident Theory

Perrow's Normal Accident Theory is part of the development of more sociologically based theories of risk, (see Chapter 2). Such theories have largely developed since the 1980s, as a counter-weight and critique of the more quantiatively based approaches to risk. these theories can be categorised into tow main areas: systems theories and risk communication.

Systems Theory

The use of systems theory dates back to the 1920s and the work of the biologist van Bertalanffy who developed the idea that whilst outwardly different, many organic systems shared internal similarities. When applied to the study of risk, theorists such as Turner (1978 etc) and Perrow argue that disasters are the result of fundamental systems failures; being the result of a combination of human and technical failures. For example, Horlick Jones

(1990) has argued that such systems failures predominantly represent human, or technical failures within organisational systems. The implications of this is that any analysis of system failure needs to take account of both human and technical types of error as these are reliant on each other for the operation or failure of the overall system.

Or as Turner puts it:

> It is better to think of a problem of understanding disasters as a 'socio-technical' problem with social organization and technical processes interacting to produce the phenomena to be studied.
>
> [Turner, 1978:3].

Charles Perrow and Normal Accident Theory

Perrow's Normal Accident Theory (NAT), argues that catastrophes will continue to happen and are becoming an inevitable aspect of advanced and high technologies. In a direct sense accidents are functions of such systems. As he states:

> Many high risk systems have some special characteristics, beyond their toxic or explosive or genetic dangers, that make accidents in them inevitable, even "normal." This has to do with the way failures can interact and the way the system is tied together. It is possible to analyse these special characteristics and in doing so gain a much better understanding of why accidents occur in these systems and why they always will.
>
> [Perrow 1999:4].

The more tightly coupled and interactively complex such systems are the more likely a system is liable to fail. Perrow again:

> If interactive complexity and tight coupling - system characteristics - inevitably will produce an accident, I believe we are justified in calling it a normal accident, or system accident. The odd term normal accidents is meant to signal that, given the system characteristics, multiple and unexpected interactions of failures are inevitable. This is an expression of an integral characteristic of the system, not a statement of frequency.
>
> [Perrow, 1999: 5].

Perrow also highlights operational error as the most common feature of accidents, but qualifies this by pointing to the organisational context and the conditions under which they work. Thus operators may find themselves faced with multiple technical failures, which militate against their ability to avoid disaster. This isn't the case with the rail system as it is still characterised by low technologies, but it has become a highly fragmented industry that has increased system complexity and 'tight coupling'. See for example Horbury 1996; Evans and Horbury, 1999; Evans 2000.

The application of Perrow's theory to the history of the UK Rail system over the period 1993-2001 will be designed to illuminate developments and to suggest changes to the present complex system.

Risk Communication

A secondary theme in studying the development of risk management in the UK Railways is the way decision making about risk and safety has been devolved to experts and regulators via the Safety Case system, (see Chapters 4,5 & 6). This will be done in terms of examining Risk Communication theory. Risk Communication theories are concerned with the dialogue, or lack of it between experts and the 'lay' public; at the heart of which is a risk communcation deficit.

The Risk Communication Deficit model as developed by academics such as Wynne (1992) and Irwin (1995); Irwin and Wynne, (1996). This postulates that 'official science' is portrayed as objective and disinterested, in contrast to other sources of knowledge and information which can be the result of research influenced by interested parties.

In this model not only is scientific advice objective, but is assumed to be the only legitimate form of knowledge; rendering other approaches and understanding illegitimate. Moreover, Wynne (1992), points to its essentially unreflective nature in that any underlying social/cultural and political assumptions and uncertainties are weeded out to give the appearance of coherence and integrity, (Wynne 1992: 278). They also point to the exclusive nature of the approach, where the public is effectively excluded because the use of technical concepts and language.

Another aspect of risk communication to be highlighted is the degree to which experts disagree with each other as to what constitutes a risk in terms of 'multiple social realities.' In this context, Borodzicz (1995) cites the Exxon Valdes oil disaster where it was found that there was considerable confusion among expert decision makers. In terms of transport safety, Borodzicz again disagreement this time over safety belt legislation. Thus their introduction was widely hailed by safety experts, but challenged by John Adams, (1985; 1995), who argued that any assessment of safety effects should not only include assessments of driver injuries that might have been reduced, but also of pedestrians and cyclists; on the grounds that seat belts gave drivers a greater sense of safety that translated into driving speeds increasing. Such disagreements will be revealed in chapters 5 and 6, where using the same methodologies, experts representing different parties to the Ladbroke Grove Inquiries came to radically different conclusions.

To achieve the aims of the thesis, it will be structured thus:

- Chapter 2 will discuss the theoretical perspectives upon which the empirical analysis will be based, with emphasis being placed on Perrow's Normal Accident Theory.
- Chapter 3 outlines the managerial developments in the Rail Industry before and after the 1993 Railway Act, which initiated the present rail system, and the consequential effects on how the industry was to be regulated.
- Chapters 4 and 5 will discuss the implications of this process and how it affected the management of safety. In this respect, the adoption of QRA techniques and the ALARP principle will be analysed.
- Chapters 6 and 7 will establish that the fragmentation of the industry, which characterised the post privatised era, introduced increased complexity into the system, with accountability now being based on contractual arrangements between the component parts of the industry. These new arrangements created an 'open system' as characterised by Perrow and served to nullify the agreed safety regime and approach to risk assessment.

As part of this, consideration will be given to the role of the regulatory bodies and the part they have played in contributing to system complexity. Thus it will be argued that the industry's economic regulators, the Office of Rail Regulator and the SRA (formerly OPRAF.), militate against safety on the railway by introducing pressures on organisations to meet performance targets, or face severe financial penalties, that have acted as a countervailing force on safety considerations. Additionally it will be posited that the safety regulators in the form of the Health and Safety Executive, (HSE), and Her Majesty's Rail Inspectorate, (HMRI), exhibit characteristics of being 'captive' regulators because of their over reliance on Railtrack - the main organisation most directly subject to regulation.

Finally, the notion of the railways as an 'open system' will be reinforced by placing the regulated parts of the system, and its principal method for ensuring safety – the safety case - into the wider context of an industry that contains a large element of unregulated organisations and firms that work on a sub-contracted basis. The result of this is that the industry far from being united and led purposefully led is in fact a system where responsibilities are fragmented, one characterised by economic and commercial pressures and with a history of poor management of safety provision.

Given this, it will be demonstrated that the safety case regime has been shown to have failed and attempts to utilise QRA methodologies have at best been only partially successful and in some cases actively detrimental to safety. Consequently, any calls for an expansion of the safety case regime, such as the recommendations arising from the Ladbroke Grove Part 2 Inquiry are as yet ill advised. In the light of this conclusion, the final Chapter will briefly explore alternative strategies, including placing the emphasis on safety on to individual operators by way of introducing punitive fines and raising the possibility of individuals and companies being prosecuted for corporate killing. How this was established and the methods used are the subject of the final section of this introductory Chapter.

Methodology

As part of constructing the thesis it was decided to place the Methodology in the appendices. This was done in order to facilitate a more unified structure to the piece. As such this section is intended as detailed resume of methods used, and a more detailed discussion can be seen in Appendix 1.

More than one methodology was employed in the research of the piece given the need for triangulation. However, the decision to adopt an eclectic approach proved to be of an advantage given the events that occurred during the research and writing of the project. In particular, the public inquiries arising out of the Ladbroke Grove and Hatfield disasters and the author's interviewing of principal actors involved in the rail system and its regulation proved to be a rich and valuable source, something that would have been circumscribed if one methodology had been used.

Case Studies

The thesis had two main aims: to examine the validity of the change in the way risk management was designed and implemented in the years leading up to and following privatisation of the rail network, and to make a wider commentary on the adoption of Quantitative Risk Assessment techniques across government departments and associated agencies. These examined in the context of Normal Accident Theory. In order to do this it was decided to identify one industry that had been privatised and where safety was considered to be a major priority and to conduct what was in effect a case study into how this process had increased complexity. The choice to research the rail industry was based on the belief that it would prove to be a rich source of material, both in quantitative terms as well as in diversity.

Case Studies

Case studies involve the systematic gathering of information with a view to understanding effectively how its subject operates and functions[2]. In

[2] Shaughnessy, J J & Zechmeister, E B (1990) *Research Methods in Psychology,* New York, McGraw-Hill

this sense a case study can use a number of data methodologies and technologies, such as among others, documents, interviews and observation.

In this they offer the opportunity for insights and possibly hypotheses that can then be built upon and developed by subsequent researchers. However they raise objections over issues of in terms of objectivity and particularity. For example the researcher may have made too many subjective decisions to offer an objective series of results

The second consideration is the degree to which case studies are capable of forming generalisations.

Intrinsic, Instrumental and Collective Case Studies

Stake (1995) categorises case studies as coming in 3 main forms; intrinsic; instrumental; and collective.

Intrinsic: There are unique and particular cases where the researcher seeks to find out more or understand about a particular case and isn't concerned with generalisations.

Instrumental case studies are by contrast designed to provide insight into some issue in order to refine, or comment upon some theoretical explanation.

The third form of case study is the Collective case. These are combinations of the above, where the researcher has several interests and objectives and there is no demarcation line between intrinsic and the instrumental aspects of the research. The present research falls into this category, in that it concentrates upon the rail industry and issues of privatisation, but it also seeks to throw socio-technical theories into relief.

Methods

Once the decision was made to use a case study approach, a decision was required on the nature of collecting and assessing the data. Given the size and complexity of industry it was decided that data would be collected and interpreted by means of documentary research, triangulated from other documents and interviews with main actors and commentators in the industry. Some of these interviews were of a confidential nature.

Documentary Research

Documentary research in the social sciences is now a relatively neglected approach. However documents remain an important source of data on human behaviour and activities. They are also the bedrock of any research into the past, which was one of the approaches undertaken in the thesis.

Documents

Documentary research can be divided between primary and secondary documents. The distinction is the degree to which the document is contemporary to the source of the data itself. Finnegan (1996) draws the example of Magna Carta. The document itself is a primary source, but commentaries on its significance have been produced in the centuries since. As such secondary sources "copy, interpret or judge material to be found in primary sources." (Finnegan 1996: 141).

Thus Primary sources are the stuff of history, telling us what and why people are thinking and tell us about their views and intentions. Secondary document research is about the commentaries and interpretations of other researchers/ academics on the originals.

For example, primary sources used in the research included: Official Publications, including Government White papers; green papers, or consultation papers; Acts of Parliament; Parliamentary Select Committee reports/ minutes of evidence. Additionally, there was available a plethora of reports and press releases from Governmental agencies, such as the Health and Safety Executive, (HSE) and Her Majesty's Rail Inspectorate, (HMRI); these being complemented by commissioned reports undertaken by academics and practitioners.

Other 'Official' documents that were consulted included individual Company reports/ publications, such as Train Company Reports, Railtrack safety reports etc. Also, Trades union documents; Pamphlets from pressure groups, Reports from Extra Governmental Organisations, (EGOs).

Of major significance here is the use in the thesis of transcripts of Public Inquiries. Turner (1978) most notably used this approach in his study of public inquiries in order to formulate a socio-technical model for disasters, (see Chapter 2). This research emulates this approach in the use of material and testimony from public inquiries into the Southall, and Ladbroke Grove crashes. However, the main aim wasn't to replicate or confirm Turner and Toft's theories, through establishing the causation of individual disasters, but to establish the principal of organisational complexity as evident in the rail industry on the lines of Perrow's theory, 'Normal Accidents', (see Chapter 2).

The great advantage of Documentary research is that it is a very time and cost effective way of conducting research and collecting data. This enables the researcher the chance to extend his/her studies much wider than through other approaches; making for a more extensive and often efficient project, by avoiding many of the logistical and practical problems associated with other forms of research.

Secondly, because it is an 'unobtrusive' form of research it can avoid many of the problems of bias that for example compromise research based on the It can also avoid any of the practical problems associated with other forms of research, such as the behaviour and attitudes and researcher constructing research instruments, such as interview schedules and questionnaires.

The great disadvantage is of course that documents are sources that are produced from beyond the researcher's control. This leads to a situation where the researcher is reacting to existing data when forming hypotheses and theories, rather than the favoured method in social sciences of forming them first before testing them with data. In particular it has been stated that documents far from being objective are essentially social constructions of the organisations that produce them. As Finnegan states:

> All sources do not just arise automatically through some process of nature [but are] results of human activity. They are produced by human beings acting in particular circumstances and with in the constraints of particular social, historical or administrative conditions
>
> [Scott 1990: 143].

This is very much the case with for example the production and preparation of official documents, again Scott:

> Official documents are shaped by the structure and activities of the state, both directly and indirectly... they are often the by-products of policy and administration and interests of state agencies.
>
> [Scott 1990:59]

In this respect, the data needed to be subject to independent corroboration, through a process of triangulation. Deconstructing the documents referred to did this, in order to establish their utility as source material. Additionally, interviews were carried out with officials of organisations responsible for the production of documents. Lastly the researcher undertook a series of observation exercises consisting of attendance at public seminars where some of the main decision makers were present.

Deconstructing Documents

If documents are social processes then the researcher has to assess documents and to deconstruct them for meanings a number of issues have to be assessed. Scott [1990] summarises these under the following headings of authenticity; credibility; and the degree to which they can said to be representative and to carry meaning.

The document's authenticity will be increasingly problematic the farther back in history you go. In this case, the study was concerned primarily with events since 1979, and in the rail industry from 1987 – 2001. This meant that most of the documents consulted were contemporaneous to the events and actions described. For example, Select Committee reports on the Rail industry were published within months of evidence taken. It was also possible to assess any conclusions drawn by cross-referencing with the evidence as available in separate publications and via the Internet. Similarly, reports on disasters from the Health and Safety Executive, (HSE) were produced in a reasonable time frame. This meant that again any cross-referencing could be undertaken reasonably easily by interviewing the authors concerned, (see below).

The second element in establishing utility is to establish a document's credibility. Given that documents are a priori selective representations of data etc, there needs to be some examination of how and by what processes the document has been assembled. These would include both the production of official statistics and transcripts of Public Inquiries. This will serve to place into relief the data arising from them. The same can be said of information from Select Committees. Again this was the subject of interviews with representatives of the organisations involved.

The third aspect when deconstructing documents is to assess the degree to which they can be said to be representative. Again this didn't prove to be an issue in this research because of the sheer volume of documents that arose from different sources, (see bibliography). Additionally, during the research itself there were two major train crashes - Ladbroke Grove and Hatfield - and no fewer than four public inquiries and criminal and civil prosecutions pursued, providing fresh points of context for assessing. Additionally, they have been augmented by reference to reports into significant crashes from the 1970s onwards.

The final aspect of utility is to ascertain a sense of a document's meaning. This leads to the idea that data from documents should be checked not only from other documents, but preferably also from at least one angle, by the process of Triangulation.

Triangulation

Porter (1994) traces the idea of triangulation in the research process to the concept as used in surveying and navigation. Thus:

> The navigation analogy is more accurate, referring to the process whereby a position is 'fixed' using, preferably, different kinds of measures, for example compass bearings, depth surroundings and radio bearings..... the underlying idea is that the wider the variety of evidence you can bring to bear, the smaller the area of doubt.
>
> [Porter 1994: 70]

Triangulating data from the sources referred to was done by reviewing secondary sources and by undertaking fieldwork in the form of interviews with experts and operators; regulators; political lobbyists; campaign /pressure groups and lawyers in the field.

Interviews

Cohen and Manion explain the role of interviews as serving three purposes. Firstly, as the principal means of gathering data. Secondly, in order to test hypotheses or to explore new ones. The third reason was to triangulate existing data gathered by other methods. This research aimed to use them for the second and third reasons.

The interviews themselves ranged from academics, politicians, civil servants and most crucially practitioners. Thus officials from Train Operating Companies; Railtrack; Regulators; Unions; Lawyers and pressure groups were approached with a view to gathering their views on safety in the industry and to illuminate sources produced by their respective sources. The approach being one of 'snowballing' whereby issues raised at one interview were used to inform subsequent ones, in a reflexive exercise.

Semi- Structured interviews

In the light of the subject and the relative homogeneity of the subjects, (i.e. that they were experts in some aspect of the rail industry, or the legal and academic professions), it was decided that the principal choice would be between the structured and the semi-structured approach. The standardised interview could have been conducted relatively easy with experts and practitioners as they exhibit the same meanings when discussing phenomena even if they disagree on their conclusions. However, in the context of discovering issues such as for example, the utility of the safety regime in the industry, this would have only replicated information already gleaned from documentary evidence, without placing it in context. Thus it was decided to concentrate on the semi-structured approach. This gave the more discretion in deciding in which direction it would and to react to issues that were raised. The idea being to analyse the broad areas of coverage in the subjects to be raised, but to allow their interpretation and identification of the main issues involved. One avenue that was explored in the interviews was the role of public inquiries in bringing out salient points in the research.

Public inquiries

As previously stated the use of data arising from public inquiries constituted a significant part of the research. In order to place such information in Public Inquiries in their proper context, a critique of their format and procedures was undertaken again using data extracted from subjects involved and associated commentaries. Finally, the researcher used observational exercises as another aspect of attempting to triangulate data.

Observation

The observation element of the research took form of the researcher attending a series of public seminars that were conducted in conjunction with the relevant public inquiries, (see Appendix 2).

The principal form of observation used in the thesis was non-participant, rather than the more usual participant observation approach. Thus whilst public observers were allowed to ask questions of the participants, this was mediated through the seminar's chairman. Also, whilst the seminars allowed the researcher to observe subjects that he had been previously interviewed and was thereby afforded the opportunity to assess data already collected, the seminars themselves were highly structured and directed by the seminar secretariat, in the form of pre-ordained questions. This meant that triangulation was limited and indirect. That said the areas of discussion were of great significance for the research and issues raised were to a large degree concomitant to the research.

Having outlined the main issues to be addressed in the thesis, how it will be structured and given a resume of the methods used, Chapters 2 will discuss the theoretical perspectives of risk that will inform subsequent discussion.

Chapter 2: Theoretical Perspectives

As outlined in the introduction the aims of this thesis are to examine the utility of the way safety management was delivered in the UK Rail Industry in the years immediately prior to and following the 1993 Railway Act which privatised the industry. How this was done and the changes that occurred is the subject of Chapter 3.

In the meanwhile this chapter will discuss some of the theoretical themes that provide a back cloth to the analysis in chapters 4-7. This will include discussion of rival perspectives on risk that have developed, as well as the disparity between expert and lay people's views as outlined in the Risk Communication Deficit model.

More specifically, the traditional, engineering approach to risk management that characterises the way risk has been managed on the Rail network since the late 1980s will be discussed, both in terms of the methodology employed and the role of experts and regulators. This will then be assessed along side the socio-technical theories of risk that have developed to rival it. However, in order to do it is first necessary to define the concepts of risk and risk management as they are understood by practitioners and regulators in the industry.

Risk and Risk Management : the Royal Society Reports 1983, 1992

The 1983 Royal Society report defined risk as being:

> The probability that a particular adverse event occurs during a stated period of time, or results from a particular challenge. As a probability in the sense of statistical theory, risk obeys all the formal laws of combining probabilities.
>
> [Royal Society 1983: 2]

Building on this the Royal Society defined risk management as the 'overall area concerned with hazard identification, risk analysis; risk criteria and risk acceptability' [Royal Society 1992: 5]. Thus it aims to manage hazards and threats and their associated risks to a given activity, in order to reduce the probability of an adverse event occurring, as well as reducing a consequent mitigation of its impact. As Waring and Glendon state:

> Risk Management assumes that that is it both feasible and desirable to manage hazards and threats in such a way that (a) pure risks are eliminated, reduced or controlled and (b) speculative risks in enhanced utility and benefit.
>
> Waring and Glendon (1998)

Waring and Glendon amplify this definition by characterising risk management as being the inter- play of four elements: hazards and threats; the context within they exist; risk management objectives; and the methods employed to achieve them. At the heart of risk management is the identification and quantification of the risks associated with a particular activity.

These will be discussed in greater length in chapter 4 in connection with the rail industry. For the moment it's sufficient to note that risk management techniques are very much based on the engineering, or scientific perception of risk with its emphasis on probability and impact. This approach is the subject of the following sections.

Science and Risk

As already intimated, the scientific approach is based on probabilities of events occurring and attempts to measure the adverse outcomes of such events. This approach falls beneath what Renn (1980) classifies as Technical Risks in his taxonomy of risk.

Technical risk embraces three subsets of risk analysis: Actuarial, Toxicological and Probabilistic. As implied, the actuarial approach relies on statistical data, which can be used to predict future risks. The toxicological analysis is similar but is more explicitly concerned with casual relationships between potential risks and physical harm to the environment and /or organisations. Probabilistic analysis is specifically concerned with technological hazards and predicting failure of technological systems. What groups the three together is that they try to anticipate physical harm through probabilities as expressed through averages over time and space and relative frequencies. The underlying presumption is that such hazards are seen as being universally undesirable and that such analysis can expose, avoid, or mitigate the causes of such hazards. But the practitioners and arbitrators of such analysis are an elite sector of scientists and engineering experts. As Renn concludes:

> Technical analysis provides society with a narrow definition of undesirable effects and confine possibilities to numerical possibilities based on relative frequencies derived from experiments, models, expert judgements and others.
>
> [Renn 1998: 58]

Risk Assessment

In the scientific approach, risk is expressed primarily in terms of fatalities. This is principally because death is an absolute and recorded systematically, Fox (1981), Adams (1995). The 1992 Royal Society report elucidated this further by classifying risk in terms of individual risk; loss of life expectancy and Societal Risk. [Royal Society 1992:24-26]

Individual Risk

Also known as mortality rate, this is derived by dividing the number of annual deaths by the total population affected, or exposed to the particular risk. As the Health and Safety Executive, (HSE), put it:

> The risk to a particular individual, either a worker or a member of the public [that is] anybody living at a defined radius from an establishment, or somebody following a particular pattern of life.
>
> [HSE 1988: para 48]

Using measurements other than time can refine this simple formula. In the railways for example, passenger deaths are expressed not just by annual statistics, but in terms of deaths per billion passenger kilometres (km), [Evans, various]

Expectancy of life

Using a loss of life expectancy opens up analysis of risk to cover specific groups within society that are exposed to hazards, part of their daily lives – whether in terms of the activities they routinely undertake, or by being exposed to hazardous situations, or substances. Examples here include people who work in occupations where there are exposed to hazardous substances, and which might continue to have adverse effects both during and after exposure. The methodology used here is to assess age- specific deaths amongst such groups; comparing them to life expectancy in the population as a whole. This has been criticised as being a 'crude approximation' of life expectancy. [Royal Society 1992: 76]. Also, it only operates on the individual level and ignores the assessment of the effect within the groups of people affected. Calculating this involves by multiplying individual life expectancy loss by the probability that any one individual will be affected.

The final measurement involves the notion of societal risk and this is an area where the notion of the 'objective' or scientific perception of risk is widened out to include complementary if different methodologies in assessing dimensions of risk, such as the psychometric approach. This is because of the use of notions of 'acceptability' and 'tolerability' as defined and practised by the nuclear industry and more widely throughout industry by the Health and Safety Executive.

Societal Risk

In defining societal risk, scientists and risk practitioners recognise, that a given activity can have wider consequences than to those immediately exposed, or involved. As the HSE state:

> [Societal risk] is the total harm suffered by a whole population and to the future of whole communities.

[HSE 1988: para 48]

Another definition from the chemical industry makes it clearer:

> Societal Risk is the relationship between the frequency and the number of people suffering from a specified level of harm in a given population from the realisation of specified hazards.
>
> [IChemE 1992]

The implication of this is that risk is expressed in terms of two elements – the frequency, or probability of something happening and the consequence of it. Professor Farmer of the United Kingdom Atomic Energy Agency (UKAEA) first developed societal Risk from the Nuclear Industry, with the presentation of a paper, in 1967. This proposed that estimation of risk in the industry should change from one of probability, or frequency of accidents versus the *distance* away from populations, to one equating probability and frequency of accidents, to the *numbers* of the population at risk from the resulting exposure. This was conceived on the basis that historical data had shown that the chances of a large scale accident varied inversely with the consequences. [Farmer 1967]

This basic proposition was refined throughout the 1970s and1980s as Quantitative Risk assessment (QRA), techniques were applied to establish statistical representations of the probability and consequences of specified hazards. This led to the development of the FN (Frequency Number) curves to demonstrate the likelihood of risk occurring. Professor Farmer of the United Kingdom Atomic Energy Agency (UKAEA) first developed societal Risk from the Nuclear Industry, with the presentation of a paper, in 1967. This proposed that estimation of risk in the industry should change from one of probability, or frequency of accidents versus the *distance* away from populations, to one equating probability and frequency of accidents, to the *numbers* of the population at risk from the resulting exposure. This was conceived on the basis that historical data had shown that the chances of a large scale accident varied inversely with the consequences. [Farmer 1967]

. FN curves are used for illustrating three risk criteria:

1. To illustrate the historical record of accidents.

2. To illustrate the results of QRA assessments.

3. To display criteria for judging the tolerability/acceptability of QRA outputs.

The notion of Societal Risk and the use of FN curves bring with them two important concepts: the notion that levels of risk public 'acceptance' and 'tolerability' should be included in the regulation of risk for certain activities and that theses can be assessed using Quantitative Risk Assessments (QRA), techniques.

'Acceptability', 'Tolerability' and ALARP

Sir Frank Layfield first enunciated the notion of acceptability and tolerability in assessing societal risk, in his report on the Inquiry into the siting of the Sizewell B Nuclear Power Station, in Suffolk. This concluded that in terms of risk that:

> the opinion of the public should underlie the evaluation of risk... there is at present insufficient public information to allow understanding of the basis for the regulation of nuclear safety.
>
> [Layfield 1987:7]

It is the setting of such levels of acceptability and the methodologies to establish them that has caused the most controversy.

The HSE and Tolerability

> [Tolerability of risk is] A willingness to live with a risk, so as to secure certain benefits in the confidence that it is being properly controlled.
>
> [HSE 1988: para 45]

In response to Layfield, the HSE published landmark studies, which defined levels of tolerability of risk in terms of the operation of nuclear power stations. [HSE: 1988: 1992]. In these documents they assessed and quantified acceptable probabilities of a 'major' civil accident ' occurring. (Defined as causing up to 100 deaths from cancer related disease), along with the 'acceptability of such accidents occurring. This was done by balancing the benefits of operating technologies as against the potential costs of accidents. To do this, they defined costs as having three components: loss of life; the costs of dealing with the event as an emergency; and finally in terms of some quantification of lasting shock and disruption 'to social and political life' (HSE 1989).

The results were that three levels of acceptable risk were established:

1. The risk is so great, or the outcome so unacceptable, that it must be refused, irrespective of the benefits arising out of the activity.
2. When the risk is so small that it is negligible, requiring no further action to reduce risk.
3. The in between region where risk should be lowered to the acceptable level, or As Low As Reasonably Practical, (ALARP).

These were defined in terms of probability of accidents affecting various groups in society, thus:

Table 1: The Levels of Tolerability of Risk: HSE 1988, 1992.

Category	**Just Tolerable**	**Acceptable**
Occupation	10 –3 (1 in 1,000)	10-6 (1 in million)
The Public	10-4 (1 in 10,000)	10-6 (1 in million)
Major Accident	10-4	10-6 (1 in million)

As can be seen, the levels of unacceptability lie if there is chance of an accident below 1 in 1,000 for workers in a particular industry, for example train drivers, but this increases to 1 in 10,000 for the public. Again in the rail industry this would apply to passengers, (see Chapter 4). The extra category applies to the occurrence of a major accident. The distinction being made because the HSE concluded that accidents incurring multiple deaths cause a particular degree of risk aversion that is over and above accidents causing single deaths. As they stated:

> There seems to be an additional element of public aversion to the chance, however small, of an event, which might kill a large number of people.
>
> [HSE 1989: para 61].

Associated with the issues of tolerability and acceptability is the ALARP principle.

ALARP

> The notion of balancing risk of death and injury against the costs of preventable measures is integral to the Health and Safety at Work Act and is expressed in the ALARP principle.
>
> [Davis 1995]

It is suggested there are some activities that involve such high probabilities of failure, or carry such potentially grave consequences that they should under no circumstances be undertaken. Alternatively, some activities are considered so low in risk that regulation of them isn't necessary. However, by definition, there is an in between area where the aim should be to reduce risks as far as is *practicably* possible. This is the area where the ALARP principle operates, and where there is a trade off between the benefits of undertaking the activity, as against the cost of further reducing risk. As the HSE put it:

> [The risk] must be reduced to the lowest level practicable, bearing in mind the benefits flowing from its acceptance and taking into account the costs of any further reduction.
>
> [HSE 1992:2-4]

ALARP is a legal concept enshrined in the 1949 case Edwards versus the National Coal board where the plaintiff, Edwards, was unsuccessful in suing the NCB for negligence; the decision being that the NCB had taken such measures to prevent accidents as far as was 'reasonably practical'.

This introduced the element of quantification and computation of risks into any assessment. As the judge, IJ Asquith stated:

> "Reasonably practical" is a narrower term than physically possible and it seems to me to imply that a computation must be made by the owner in which the quantum of risk is placed on one scale and the sacrifice involved in the measures necessary for averting the risk….is placed on the other; and if it be shown that there is a gross disproportion between them, the risk being insignificant in relation to the sacrifice- the (person on whom the duty is laid) discharges the onus on them (of proving that compliance was not reasonably practicable.)
>
> [1949: 1KB 704]

At the top of the ALARP region, the risk level associated with activities must be reduced unless the cost of doing so is grossly disproportionate to the improvement gained. Conversely at the bottom, the risk level must be reduced unless the time and resources needed exceeds the benefits in improvements. The area in between is where ALARP operates and there is a balancing and weighting of costs and benefits to assess whether schemes should be introduced.

The ALARP principle essentially accepts that some degree of risk is inevitable, and that consequently the emphasis should lie, not with total elimination of risk, but with assessing what level of risk is tolerable. This implies that 'acceptability' should have a monetary value, based on the cost-benefit analysis that risk managers take often quantifying risk. Such quantification of consequences has been left to individual operators of high risk technologies. As Lord Cullen commented in his Inquiry into the Piper Alpha disaster in 1988.

> It is normal practice that standards for QRA are set by the operator. The HSE has published documents on risk and risk criteria but as guidance.
>
> [Cullen Report 1990: para 4.12]

Societal Risk: Some Criticisms

The basis for making judgements using 'Societal Risk' has been doubted For instance, Ball (1998) concluded that much of the beliefs about the contribution multiple accidents have on causing risk aversion, or increasing a sense of risk, were anecdotal in nature. Rather, he concludes that the degree to which the public responds to such accidents is exceedingly complex and dependent upon many interlocking and interdependent factors. Among others, he points to the importance of the sources of information about such events – and possible media coverage etc -and the degree to which they regard/trust the agency responsible for the hazard. In support of this point, he quotes the notorious photograph from the Vietnam war, of the naked child fleeing from a village that had just been bombed. This leads him to conclude that:

> It [is] difficult, if not impossible, to draw any reliable conclusions on the proportionality of public views about major versus minor accidents from casual post-event observations.
>
> [Ball 1998:19]

The debate generally about the use of weighted aversion responses is contentious and thus far unsubstantiated either way. Thus Jones – Lee & Loomes (1995), found that the risk of large-scale accidents on London Underground had no affect on the public' Willingness To Pay for extra safety measures. A similar study in 1997 by Evans and Morrison (1997), found that large scale accidents did have an after affect in terms of numbers travelling on the railways immediately after a large scale crash. However, it could be argued that the costs incurred would count as those associated with business interruption, rather than ones needing public sector input.

A more fundamental issue is the utility of the concept itself, with the HSE definition attracting criticism from HSE employees themselves. The practitioners inside the rail industry for example, adhere to the FN analysis (see above, Rose; Evans; Maidment etc.) concerned primarily with multiple fatality accidents. By contrast, Ball's 1998 study suggested a refinement that took account of the wider context of such event; including the overall impact of particular technologies and activities, such as the development of GM foods. These he argues should be referred to as 'Societal Concerns'

Against these criticisms, Pidgeon has pointed out that by establishing such notions, risk regulators and practitioners have implicitly recognised that 'objectivity' is neither possible, nor desirable and that methodologies beyond the scientific paradigm are needed. As Pidgeon concluded

> The HSE's approach to this definition (of 'tolerability') to guide regulatory decision-making is clearly a significant development. It implicitly bridges technical and social science considerations of risk by acknowledging that it is individuals and groups in society that must life with risk.
>
> [Royal Society 1992:93]

This latter point recognised that regulators and operators *had* begun to recognise that decisions about risk couldn't be the preserve of 'experts' alone, and that some cognisance should be taken of public perceptions. Chapters 4-6 will illustrate the degree to which this approach and the related QRA has determined safety decisions in the UK Rail industry in the period covered.

Sociology and risk

The critique of the traditional or rationalist based view of risk has come from a number of sources within the social sciences. This section will discuss the sociological aspects including the view that disasters, far from being 'haphazard' not only share similarities but can also can be seen as the result of the interplay between sociological and technical factors within organisations. (Turner 1976; Turner & Pidgeon 1998).

Short (1984) noted the development of such challenges and identified the need for sociological based research to inform a risk analysis characterised by a 'lack of social and cultural authority' [Short 1984: 715]. Following Short, the body of literature on the subject began to grow, with key issues emerging. These included the identification of the characteristics of technical, as opposed to natural disasters; the role of human error and the importance of organisational, institutional and cultural factors [Clarke & Short

1993]. Discussion on individual theories will be reflected further when drawing on evidence from the rail industry in Chapters 6-9. However for the moment it will be sufficient to draw general points about their contribution to the debate on the importance of sociological factors.

Risk and the System: Socio-technical theories of risk

Perrow and Turner's work point to the complexity of high technological systems and their vulnerability to causes interacting in an unanticipated way. As Pidgeon states:

> Their accounts suggest that in complex systems unanticipated interactions between sets of contributory causes that singly, would be unlikely to defeat established safety systems will often serve to undermine safety.
>
> [Pidgeon 1991: 132-140]

In terms of the importance of sociological importance of organisational factors Clarke and Short in their article pointed to the publication of Perrow's work, *Normal Accidents,* as a defining moment. However the notion of the interaction between sociological and other factors within organisations dates back to the work in systems theory early in the last century. Thus the biologist, von Bertalanffy stated in the 1930s that:

> "it did not matter whether a particular system was biological, sociological or mechanical in origin, it could display the same (or essentially similar properties) if it was in fact the same kind of basic system" [3]

The application of such socio-technical systems approaches in organisational management was developed by work at the Tavistock Institute in the 1950s which looked at the problems of organisational change in the British coal industry as it impacted on employee stress (Trist et al, 1963). Their research led them to argue the benefits of characterise organisations as "open technical systems" combining social and technical aspects.

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[3] Quoted in Toft/ Reynolds, 1997, p. 16

Turner (1976; 1978) first pointed to the importance of sociological factors in disasters with his examination of official reports into 84 accidents and disasters, including major disasters such as the coal slide at Aberfan in 1966. On the basis of this research, he argued that apparently different disasters shared a number of similarities and characteristics. This meant that far from being 'haphazard' and caused by a single incident, or event, they should be regarded as the result of the interplay of sociological and technical factors within organisations over time. As he stated:

> It is better to think of the problem of understanding disasters as a socio-technical problem, with social, organisational and technical processes interacting to produce the phenomena to be studied.
>
> [Turner & Pidgeon 1998: 3]

> Many disasters arise solely from administrative and social causes or from a combination of technical and administrative causes.
>
> [Ibid]

Such factors may include individual errors and more complex causes rooted in failures of groups within organisations to communicate, or as a function of organisational structures. [Pidgeon 1991:131] and can take a number of years to develop; leading Turner to characterise it as an 'incubation' period.

Further, because modern operational systems are so complex it's difficult to identify the number of permutations of possibilities that could lead to disaster.

In this, Turner placed emphasis on the role of information within organisations as they attempt to deal with uncertain or unquantifiable safety problems.

Following Turner the emphasis on socio-technical factors continued and examples have included Bellamy, (1983 etc.); Perrow, (1984); Watson & Oates, (1989) and Weick, (1990). By 1988, a World Bank report could point to the increasing influence of such research and the shift in focus of research into disasters from the purely technical aspects to:

To the operator/management interface and the critical internal/external management and organisational factors that can result in [a] major system failure.[4]

Horlick-Jones, (1990) characterised their studies as illustrations that system failures predominantly represent human or technical failures of operation within organisational systems. Smith (1997) referring to the Kegworth aircraft accident whilst acknowledging the concerns with human error as the prompter of crises and disasters (see also Reason, 1987, various), nonetheless point to the importance of wider organisational issues within systems; including increased complexities that ironically maybe introduced with the aim of making systems safer. As he concludes:

The result has been the creation of a complex working environment, for operators and managers, within which both the probability of human error may have increased, and the consequences associated with such error heightened. The study of error within systems failure has therefore widened from an initial concern with the role of human operators to include a broader understanding of both managers and systems designers in precipitating systems and organisational failures.

[Smith 2000: 544].

In such circumstances it is the system that needs to be examined, with focus being on issues of communication, control, and hierarchy, (Checkland 1981.)

Charles Perrow

The dangerous accidents are in the system, not in the components.

[Perrow: 1984: 3]

what distinguishes highly complex high-technology systems is the persistence of unanticipated and often baffling interactions.

[Sagan 1995: 276]

[4] Quoted by Bellamy et al 1989, p. 2.2

If Turner et al discuss how the inter-play of socio-technical factors develop over time towards disaster, Perrow concentrates upon regarding accidents as functions of the complexity of the system within which organisations operate.

As he states:

> If interactive and tight coupling – system characteristics- inevitably will produce we are justified in calling it a normal accident, or system accident. The odd term 'normal accident is meant to signal that, given the system characteristics. Multiple and unexpected interactions of failure.
>
> [Perrow 1984: 5]

Perrow sees organisations as 'natural open systems' where 'natural' is defined as organisations who pursue their self interests in the whole and not just concerned with profit and market share etc. 'open systems' are ones where organisations interact with each other; being influenced and influencing the social and political environment, (Horbury 1996).

Thus complex systems are characterised by component parts that can interact 'with one or more other components outside of the normal production process, either by design or not' [Perrow 1984:93]. Such systems are said to be 'tightly coupled' and the time span between component interfacing is comparatively short and for instance the opportunity for operators to react to events to say, prevent disasters is limited. As Clarke & Short summarise:

> Once such a system is chosen, human efforts are limited to fine tuning and damage control.
>
> [Clarke & Short 1993: 388]

Whilst such 'normal accidents' are inevitable, nonetheless they rarely result in catastrophe, In fact ironically enough their very rarity confirms the contention that are 'normal' in that they require an unusual, but precise inter-action of many conditions to happen: 'rather like a system accident, in fact' [Perrow 1994:2].

In this context, 'operator error' is presented in a new context. Thus whilst most accidents are attributed to 'operator error' is the factor most frequently attributed accidents, Perrow points to the need for them to be considered in the context of their working conditions. Specifically, he characterises accidents as functions of the degree to which systems are complex and the degree to which its components are inter-dependent on each other. Thus, at the critical juncture, operators may be faced with having to deal with several coincidental failures of components within a system, or information systems that are inaccurate, (see also Smith 1999.) In these circumstances, the fault lies not with the operators, but within the system which they have to operate. Another element contributing to 'operator error' is the time operators have to react to systems failure The presentation of misinformation to operators during a critical time period can cause a series of system failures to proceed without effective control.

Other systems, which he labels linear systems, may not have such characteristics, and may have components that follow or precede each other immediately. As such they are consequently less susceptible to normal accidents. One such example he cites is that of an assembly line in factories.

Degrees of Complexity

Perrow sees determinants of complexity and inter-linkage as being dependent upon a number of factors including for complexity:

- the relatively tight spacing of equipment
- the closeness of production steps
- the degree of common mode connections of components
- the opportunity of isolating failed components
- the degree of pesonnel specialisastion
- the degree to which supplies and materials can be substituted
- the existence of feed back loops
- the degree to which component parts interact with each other

- indirect informational souorces
- the degree to which processes are understood or otherwise.

[Turner & Pidgeon 1997: 178]

Turner & Pidgeon, (1997), state that the degree to which systems can be said to be loose, or tight means 'the extent to which the interconnected structure can lead to the rapid and uncontrolled propagation of undesired events.' This will be dependent on:

- Unacceptability of delays in processing
- Invariant sequences in operation
- The number of methods/ procedures available to meet goals
- The degree of flexibility in terms of supplies and personnel
- Redundancies that are present in the system
- The degree to which supplies, equipment and personnel can be substituted

[Turner & Pidgeon 1997: 178]

Building upon his initial analysis, Perrow proceeded to examine a number of industries which use high technology in order to categorise them in terms of degrees of complexity and 'tightly coupling.' Thus the assembly line process used in many factory situations are both loose and linear, whereas nuclear power installations are both complex and tightly coupled. In terms of rail and marine transport, Perrow considers that whilst they are tightly coupled and operators will have comparatively little opportunity to prevent catastrophe because of speed and restrictive operating conditions. Nonetheless because of the nature of their operation, he considers that components to fail sequentially and can thus be contained. However, he conceded that his categorisation was subjective one and that there was:

> no reliable way to measure these two variables....one may well quarrel with the placements in the figure. One good reason for a quarrel is that there is no precise specification of just what constitutes a system.
>
> [Perrow 1984:96]

As such it has been argued by academics that what might appear initially not to be complex systems with tight coupling, may in fact develop either over time, or for the period of a particular incident. For instance Weick (1990) has argued that stress combined with the social, managerial, and legal environment surrounding the Tenerife air disaster combined to produce a 'normal accident'. Sagan (1993) points to the role of interest groups within organisations and systems that can contribute to 'normal accidents' even if there isn't complexity and tight coupling.

Perrow (1984) argued that rail transport wasn't a case of high complexity and tight coupling. However, in his 1999 edition he pointed to more characteristics that contributed to system complexity. These included analysis not just of an isolated system such as a nuclear power station, or chemical plat but to wider systems. Thus he now stresses elements such as fragmentation of control and density of system's environment. In this respect, Horbury (1996) argues that the privatisation process of the UK rail system created conditions that has resulted in the industry being based on complexity, which when combined with operating constraints lends validity to the Perrow theory. Perrow also argues for the importance of disseminating information on errors in mitigating the effects of system complexity. In this he is echoing the Turner- Toft model and its emphasis on industry isomorphism.

Specifically, Toft and Reynolds (1997), argue that disasters are low frequency events within organisations, but when viewed in the context of a whole industry, a number of incidents can be seen across an industry that are similar, but are not disseminated within such an industry.

Smith (2000) Smith and Elliot, (2000), Elliot, Smith and Mc Guiness, (2000), offer a typology of barriers to learning that includes:

- Rigidity of Core beliefs

- Lack of corporate responsibility
- Centrality of expertise, denial and disregard of outsiders
- Ineffective communication and information difficulties.

As a result of such factors Toft argues that the isomorphic nature of the systems have broken down and that:

> Disasters keep re-occurring because what little is learnt from them is only passed on to managers in the organisation concerned
>
> [Toft and Reynolds 1997]

Analysis of these conditions in the privatised industry will inform discussion of the risk management approach in the rail industry in chapters 4-7 inclusive. This will show that information wasn't disseminated in the years following privatisation and fragmentation has introduced complexity into the system via the creation of numerous organisations that operate, maintain and regulate the industry.

However it will also become apparent that the way risk has been managed in the industry has exhibited a case of what academics such as Wynne and Irwin and others have labeled the Risk Communication Deficit model.

This will be outlined by discussing how the responsibility for taking decisions on risk has evolved towards the expert and away from the politician with the adoption of the QRA approach based on the engineering perspective of risk, (see above).

The Risk Communication Deficit Model

Reviewing a series of public health and environmental issues in the 1990s Irwin (1995; 1998) and Irwin et al (1996) established the characteristics of the deficit model of risk communication as resting on a number of assumptions:

- It places scientific research at the centre of knowledge on risk; pushing alternative sources to the margins
- It presents an impression of coherence and homogeneity in its assumptions and procedures
- In to other sources of knowledge, Science and scientific knowledge is objective and untainted by vested interests
- Discourses are expressed in technical terms such as for example ALARP, QRA and cost benefit analysis and even where experts disagree in it usually on such terms. This leads to risk communication exercises being conducted in these terms, with the public regarded as 'blank sheets'

[Irwin 1995; Irwin and Wynne 1996; Irwin, 1998.].

Contrary to such assumptions, Irwin's and Wynne's studies found that science and scientific discourse can be found to be subject to interests and organisational imperatives. As Irwin puts it:

> Science is constituted within particular social contexts, and these will shape what eventually counts as certified knowledge.
>
> [Irwin, 1995: 58].

Secondly, the public's sources of knowledge on risk are not confined to received expert discourses, (Wynne & Irwin 1996, etc). Sjoberg, (1995) also points to the organisational influences of 'objective' scientific research. Similarly Janis (1972) with his analysis of expert decision making sees it as a function of group dynamics, or 'Group Think'. Inspite of these and the findings of numerous other studies, it will be shown that the way risk management is practised and communicated in the Rail Industry through experts sharing a common agenda: namely the 'engineering' perspective' as described above and shares their failings, (see Chapters 4, 5 and 6).

To illustrate this the Chapter will conclude by discussing the development of relations between politicians and experts and decision making about risk with particular reference to the rail industry.

Politicians and Risk

> Traditionally (Government) Departments and Agencies have operated under the assumption that with the assistance of experts as necessary, they would define the problem, assess the risks, identify risk management options and adopt decisions... and the decision adopted justified on the basis of reliance on the best independent scientific advice.
>
> [ILGRA 1998: 24]

> Yet the first bringer of unwelcome news
>
> Hath but a losing office.
>
> [Henry IV, Part II]

Concomitant with rail privatisation has been the general development of a distancing between politicians and decisions about risk. The salmonella in eggs crisis highlighted the perils of getting involved directly in such areas in 1988. Here the intervention of Edwina Currie, a junior minister of health, warning of the possible dangers of eating raw eggs, turned what had been a conflict of evidence between experts over the existence of salmonella in eggs into a political crisis that threatened to destroy the egg industry. This in turn led to a campaign mounted by among others, the National Farmers' Union that led to her resignation two weeks later. The general conclusion being that although there was substantial evidence to support her view, the force with which she delivered her warning and the prominence of her position were key factors in prompting events, [Smith 1991: 244; Currie 1989: 256].[5]

The separation between politicians and decision making about risk is achieved in a number of ways, but primarily through the use of 'expert' advice and the adoption and governmental departments of risk assessment techniques designed to de policitise decisions about risk.

Experts and Risk

Whilst expert advice can take various forms and expert committees undertake a number of functions, Everest [1989], identifies five main typologies of advisory committee or body.

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[5] She summed it up by considering that : "We all get careless sometimes." And that if she had used the word, 'much' instead of 'most', to describe the extent of the incidence of salmonella, she would have been "covered"

Firstly, there is expertise provided by governmental departments themselves; with civil servants providing the advice. This intra-departmental element on providing advice on risk was examined by ILGRA in 1996. Their report revealed that though risk assessment techniques were widely used by central government, it was by no means done in a uniform way. Rather, it had evolved over time and to suit specific needs and organisational practices and structures, [ILGRA 1998: 1].

The second source of advice is from official agencies, including Health and Safety Inspectorate reports, including in the rail industry, those by Her Majesty's Rail Inspectorate, (see below and Chapters 6-9).

The third source is from publicly funded research bodies. These represent an important source of advice on scientific issues and through the ESRC, social and political issues. (Including for example recent studies into the utility of safety case regime in the rail industry.)[6] Fourthly there is the use of specially constituted study groups, which are established to cover very specific topics and are usually short lived.

In the rail industry, this has taken the form of two groups: The Integrated Transport Task and one set up in December 2000, in the aftermath of the Hatfield crash.

The Integrated Transport Task group was set up in January 2000 and is responsible for producing a ten-year plan setting out a long term transport investment programme, based on the policies and objectives set out in the white paper, 'A New Deal for Transport.' In such groups it is usual for them to staffed with officials from the sponsoring department. In this case the Transport minister Lord MacDonald, supported by seconded civil servants chaired the group.

The task force set up after Hatfield crash group was charged with working closely with Railtrack and the train companies in order that normal service could resume as quickly as possible, while keeping risks as low as reasonably

[6] See for example, the work of Horbury and Evans, 1998-2000.

practicable. [7] To this end they were charged with keeping the public and ministers fully informed on progress of the recovery plan, and 'trouble-shooting' any unresolved issues delaying full recovery.

The group was again chaired by MacDonald, but also consisted of senior representatives from Railtrack, the Association of Train Operating Companies, the Rail Passenger Council, the Health and Safety Executive, the Office of the Rail Regulator and the shadow Strategic Rail Authority. Because of their specialism these can be highly influential in the advice they give. [8]

The last source of advice and guidance is the Advisory committee.

Advisory Committees

The most high profile type is the Royal Commission, which acts independently and has the resources and power to invite evidence and cross examine witnesses.

The second form is those bodies inside various government departments to provide either general or specific advice on policy issues and matters. Such committees typically consist of academics, 'public figures' and industrialists. The nearest form of this in the rail industry is the Parliamentary Advisory Committee on Transport Safety, or PACTS.

PACTS

The Parliamentary Advisory Council for Transport Safety (PACTS) isn't a QUANGO in the recognised sense and the staff are not civil servants. However, it is an associate Parliamentary Group, which seeks to influence government in "promoting transport safety legislation to protect human life". [PACTS 2001]. This is done by advising and informing members of Parliament on transport issues involving air, rail and road safety issues; including independent technical advice service for Parliamentarians on a wide range of transport safety matters. It also acts as a conduit between

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[7] *The Independent* Newspaper, 01/12/00

[8] Hall, (1996). P.10.

government and industry and experts to discuss and to identify research-based solutions to transport safety problems. Thus it lobbies government, identifying and promoting research-based solutions to transport safety issues through parliamentary access and contacts. It also responds to Government, Parliamentary and public proposals for safety improvements.

It also consists unofficial working groups on all the main modes of transport, including Rail Safety, where representatives of the industry, parliamentarians and academics meet to explore common themes and issues. Proposals arising from such meetings are not mandatory on participants, but they do they do provide a forum for exchange of opinions and debate. At these meetings representatives from the HSE are invited as 'observers.'[9]

Finally, it promotes wider publicity and information on safety through conferences, seminars, and publications. The role of PACTS in facilitating discussion was important in enabling the rail industry to come to a decision about the viability of adopting the ATP system of rail safety in the mid 1990s (See Chapter 4).

The last forms are those bodies that are established to implement legislation, and/or to regulate activities. In the rail industry this advice and regulation is the responsibility of the Health and Safety Commission, (HSC), and its' executive arm, the Health and Safety Executive, (HSE), in the form of Her Majesty's Rail Inspectorate, (HMRI).

The Health and Safety Commission and Executive

The Health and Safety Commission (HSC) and the Health and Safety Executive (HSE) are statutory Non-Departmental Public Bodies accountable to the Secretary of State for the Environment, Transport and the Regions (the Secretary of State). Their overall aim is to ensure that risks to people's health and safety from work activity (including members of the public affected by those activities) are properly controlled. This is done by a mixture of advice

[9] Interview notes with Rob Gifford, Chief executive, PACTS, April 1999.

and guidance to central government and industry, and by enforcing the relevant sections of the Health and Safety at Work Act, (HSAWA), 1974.

The HSC

The HSC is attached to the Department of Environment and Regional Affairs, (DETR), with its nine members appointed and responsible to the Secretary of State for Environment. Its principal functions are to advise Ministers on health and safety matters and define standards and propose legislation on health and safety matters. This is done by securing compliance with the HSAW Act; improving knowledge and understanding of health and safety through the provision of appropriate (and timely) information and advice.

The advice and guidance and regulation of workplace activities is achieved on the basis of promoting risk assessment and technological knowledge, as the basis for setting standards and guiding enforcement activities. To achieve this, there is the health and safety executive, (HSE) which is the enforcement arm of the HSC. This employs 3,880 people of which 1.497 are inspectors, covering 650,000 work establishments and sites.[10] They enforce the provisions of the 1974 Act and any subsequent regulations that have been introduced since. This is done directly and indirectly. Directly, they inspect work places to secure compliance; investigate accidents at workplaces and cases of ill health and complaint, arising from activities at the workplace, or as result of them. If a breach to the act is found, they can take formal enforcement action, in the form of notices and prosecutions.

The HSE also advises and assists the HSC and gives advice and information to employers, workers and the public, on health and safety policy. Thus a lot of time and resources is spent on producing guides to best practice, rather than going out and actively enforce regulations. Commissioning of research projects to industrial and academic experts on specific hazards and issues of general risk assessment and evaluation augment this. In this they are reliant

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[10] 1/04/99, HSE 25.

on co-operation from the industries concerned. Something they are quite explicit about:

> Given the size of the organisation as against the size and scope of its responsibilities, it is reliant on co-operation from industry.
>
> [HSE 25, 1999]

In terms of the rail industry, the HSE exercises regulation and compliance through Her Majesty's Rail Inspectorate.[11] (For details see Chapters 6-9).

Criticisms of the Advisory System

The importance of the expert in the decision making process was highlighted by the 1998 ILGRA report. Thus they concluded that:

> Once an expert group's judgement on the balance of the scientific arguments is published, pressure may be created for Government to regulate, even if it is unjustified in cost-benefit terms.
>
> [ILGRA 1998: 13]

The main criticisms of the advisory system are the lack of accountability, and transparency in their activities. Government ministers have considerable powers of patronage to include, and exclude members of Task Forces and committees etc., and thereby potentially introduce bias into the process. As Everest concluded:

> This task is in the hands of the government who are able to exclude from membership those it considers would be unhelpful to the committees' operations.
>
> [Everest 1989: 18]

In terms of the HSC, all nine members are appointed by the Secretary of State of Environment, after 'consultation' with groups representing employers, employees and those representing the 'public interest'. On this basis, the balance of the appointments is determined by the concept of a 'tripartite' representation, of commissioners representing the interests of

---

[11] Although it should be remembered that there are three other Regulatory agencies involved in the rail industry, that have some residual responsibilities that affect safety. These are SRA; ORR and the individual Passenger Transport Executives, (PTEs). How these impact on safety will be covered in Chapter 6.

employers, employees and 'the public interest'. Critics of this approach point to its unrepresentative nature, in excluding commissioners from different sectors of industry, including service sector workers and the self employed, whilst others point to the disproportionate influence the system gives to industry over health and safety guidance and legislation.[12]

This leads to another criticism of the system: that is there is a tendency for members to coalesce around views based on their collective backgrounds. Thus Hall argues that:

> This web of interconnections could form the core of an expert community which is relatively closed to outsiders.
>
> [Hall 1996:18]

Wynne goes further:

> The danger is one of shared assumptions which tend to go unexamined, but which limit their consideration of the nature of the problem.
>
> [Wynne 1996: 18].[13]

Such a problem was to be demonstrated in the rail industry over the decision made in the 1990s not to adopt Automatic Train Protection, (ATP), (see Chapter 4).

The other element of lack of accountability has been the increasing trend towards allocating decisions about risk to such non elected bodies. Thus Terry (1998), points to how the regulatory process has become increasingly detached from the democratic process over the last 30 years or so. This has been especially marked in the field of risk, potential emergency, and in metropolitan areas, fire and civil defence authorities operating apart from local authorities. The justification for this has been that of greater 'efficiency' in dealing with risk, as the authority for safety regulation rests with those most knowledgeable about the issues. This has had implications for the relationship between elected officials and quasi- autonomous specialist agencies. As he states:

---

[12] Evidence of London Hazards Centre to the Environment Select Committee 4th Report, *The Work of the HSE*, 1999-2000. February 2000. HMSO.

[13] Quoted in Hall, 1996, p18.

> One side effect of the trend… is that the institutional power of the regulators has been progressively enhanced…in the context of emergency management it has undoubtedly also been fuelled by 'media' excitement in the aftermath of various disasters…..Although the HSE, for example, is ultimately accountable to Ministers, they would seldom, if ever intervene in an HSE decision.
>
> [Terry 1998:22]

The other main criticism concerns the transparency in their deliberations. This was highlighted that by the 1998 IGRA report, which not only pointed to a lack of transparency in how decisions on risk was arrived at, but also noted a confusion as to whether experts were in fact not only advising officials but also making the decisions. [ILGRA 1998:13]. In common with most other agencies, the HSE publish annual reports which outline its work and budget. These are submitted to Parliament and available on the Internet. However such transparency is compromised when considering proposed change to regulations in individual industries. Here the onus is on MPs to object to any changes within 28 days; the changes coming into force automatically after this period.

Methodology of Risk

> The Government wants the practice of risk assessment to epitomise the process of policy making in the field of government regulation.
>
> [ILGA 1996: 2]

> The limitations of expert knowledge has long been considered as contributing to the incubation of failure potential within organisations.
>
> [Smith and McCloskey].

Government and Risk Assessment

The ILGRA reports identified the common areas where government departments and agencies use risk assessment techniques. These can be categorised under various roles undertaken by government: as an investor; a regulator; and as an enforcer, [IGRA 1996: 27]. As an investor risk assessments can help determine how much money should be spent and in which areas, or projects. As a regulator ILGRA reported that by 1996, risk assessment had already become the “cornerstone” of government’s thinking towards regulation, in both application and form.

> Moreover, the current trend is to require those creating risks to assess them and introduce control measures commensurate to the risks.
>
> [ILGRA 1996:29]

The corollary of regulation is enforcement and here risk assessment helps to identify and select areas and issues to be targeted; as well as establishing the frequency at which such activities should be carried out. This includes for example the number of inspections needed to be made etc.

The ILGRA reports highlighted a number of such examples of risk assessments in action. These included reviews by the HSE on health and safety hazards in the workplace and through environmental exposure; the drawing up of the five “key areas for action” by the Department of Health; the formation of standards for the use of additives in food and exposure to hazardous substances.

In Government departments and agencies, such risk assessments have increasingly taken the form of Quantitative risk assessment techniques.

QRA and Departments

The adoption of QRA methodologies by government departments and agencies dates back to the publication of the HSE report, The Tolerability of Risk from Nuclear Power Stations. This was in response to the recommendations of Sir Frank Layfield’s public inquiry into the building of the Sizewell ‘B’ power station, in Suffolk. Although the report was concerned with the nuclear industry and written by the Atomic Energy Agency, (AEA), it has become the underlying principle of the HSE’s approach to managing all industrial risks (Davis 1995: 17). This can be abbreviated as the “Tolerability of Risk”, TOR principle, (see above).

Implicit in such an approach was the twin notions of frequency and outcome, as expressed in monetary terms. The principle was widened to cover all industry, with the publication of the 1992 Management of Health and Safety at work Regulations.

These specifically stated that employers were required to undertake risk assessment exercises and in effect to act to neutralise them. As Appleby states: 'A company is no longer entitled to wait for a near miss or accident before it considers a potential risk' [Appleby 1999]. In fact such assessments were at the heart of the new regulations and obliged employers, (and employees) to assess their workplace(s), to identify how health and safety could be improved. Specifically, they had to identify hazards; quantify the likelihood of them occurring; and evaluate the potential consequences of arising out of its' occurrence. This was to be done on a regular basis.[14]

By the late 1990s the growing use of QRA methods was highlighted by the two ILGRA reports, which noted that most of the departments surveyed were using, or moving towards quantitative risk assessments. This was especially the case where Departments were involved in making decisions where there was potential for risk to the public. Even where Departments preferred a qualitative approach the principles of proposing action in proportion to the risks involved, as established by CBA analysis, [ILGRA 1996: 2]

QRA and the HSE

As might be expected from the agency that both sponsored the TOR report, and promotes QRA within government, the HSE 's principle approach to risk management is primarily through QRA techniques. This has taken the form of applying the ALARP principle of balancing potential benefits in safety as opposed to the costs of introducing new measures and technologies. Thus Davies:

> The notion of balancing death and injury against the costs of preventable measures is integral to the Health and Safety at Work Act and is expressed in the ALARP principle.....the Health and safety Commission has used Cost Benefit Analysis (CBA) to inform its judgements about new health and safety controls since 1982.
>
> [Davies 1995: 29]

[14] Regulation 3.

. This is made explicit in numerous documents published since then. Thus in 1999 in their memorandum to the Select Committee on the Environment, it stated that its policy of regulating industry was driven by a desire to balance its political responsibilities against the aim of not burdening business 'unduly'. In terms of framing and enforcing regulations and standards and prosecuting firms who flout them, it adopts a principle of proportionality, based on the expectation:

-

> "that business will not be hampered by unnecessary burdens, inconsistent standards or disproportionate requirements for action."
>
> [HSE 25, 1999]

This is done explicitly in terms of adopting:

> "the principles of proportionality, consistency, transparency and targeting on a risk-related basis."
>
> [HSE, 25 1999].

To achieve this they adopt a range of measures, including CBA. CBA isn't usually used by Inspectors in the 'field', or on site inspections, where complex calculations may not be necessary However it is used for initiating changes in regulations and assessing the introduction of new technologies.

QRA and Her Majesty's Rail Inspectorate, (HMRI)

The HSE regulates the rail industry through The HMRI and as with the HSE, there is increasing use of QRA techniques to frame regulations and standards. This has increased dramatically since the HMRI was moved from the Department of Transport, to the HSE in 1990. This was instigated by a number of reasons. Firstly, there was a growing problem of recruitment from the traditional sources of the Corps of Royal Engineers and the rail industry itself.[15] Secondly, in the aftermath of the King's Cross disaster in 1987, the

[15] In fact the Inspectorate had been reluctant to recruit from the industry anyway, on the presumption that former employees may be prejudiced against British Rail. (Hall 1999. P.112)

Inspectorate were severely criticised for both misinterpreting the 1974 Health and Safety at Work Act (HSAWA) and not applying rigorously enough.[16] But the prime reason was the feeling that in any newly privatised industry, the close relationship that had existed between them and British Rail, would be inappropriate to private train operators motivated by profit. In future the HMRI would stand further apart from the industry and implement and enforce the HSAWA.[17]The move also chimed with the move towards a more managerial approach to rail safety within the industry itself. (See Chapter 4).

. Just as in the management of the railways itself, the regulation of its safety was to be governed increasingly by managerial principles and by generic managers, rather than engineers.[18]

The most immediate sign of the new regime was the retirement of Major C Rose as Chief Inspector of Railways in 1988 and his replacement by Robin Seymour. He neither belonged to HMRI, but as the former Deputy Chief of the Factory Inspectorate, had none of the engineering background of previous inspectors either. Similarly the old tradition of recruiting from the military was scaled down, with staff increasingly drawn from within the HSE itself, with a generic understanding of health and safety; as well as ex-railwaymen. The effect of these developments was to change the balance of the culture from within the HMRI from the old technical, prescriptive, approvals-type regime, to one stressing goal setting and risk based safety management systems approach of the safety case regime. [19]This hasn't been

---

[16] Thus the Inquiry's Chairman, Desmond Fennel, QC concluded: "The Railway Inspectorate was mistaken in its interpretation of the law in believing that, if London Underground discharged its duty to have due regard to the safety of operations, it had discharged its statutory duties for the health and safety of passengers... Even allowing for the Railway Inspectorate's misunderstanding of their responsibilities, it is my view that the level of resources and degree of vigour they applied to enforcement were insufficient."

[17] Hall. 1999. Also, the author's Interview notes with Maidment 1999, and Coleman 2000.

[18] Ibid

[19] Thus the HMRI is planned to double its staff to 200 by 2002, with the bulk coming from within the HSE. Coleman, V (2000c), Modern Railways, November 2000.

a complete success and just as in the industry itself, the engineer, or railway culture has persisted. As a HSE internal report written ten years after the process started stated:

> the 'winning hearts and minds' approach adopted appears not to have been as effective as originally expected.
>
> [HSE 2000: Internet Version][20]

The effect on the HMRI's operations has to direct their resources to targeted areas, as revealed by statistical analysis. Thus topics are chosen to form the core inspection programme each year based on an assessment of the areas where there is scope for improving the control of risks. For example in 1998-99 particular attention was paid to incidents where signals are passed at danger (SPADs); track maintenance; platform/train interface at stations; trespass and vandalism.[21]

Also when it comes to accidents the percentage of accidents investigated by them is very small, some 3% and decisions to investigate are, like its parent organisation, based on a mixture of 'proportionality' and political reality. [22] (See also Chapters 4 - 7).

Finally, the various advisory experts and bodies on rail policy also base their decisions on the QRA approach. Thus for example, PACTS state whilst their aim is to 'promote transport safety legislation to protect human life', it does so with 'regard to cost, effectiveness, achievability and acceptability.'[23]

---

[20] http/www.hse.gov.uk/railway/paddrail/issues. This conclusion echoes Horbury, 1996 and information gleaned from interviews by the author.

[21] HMRI web site. www.hse/gov.uk/railway

[22] Coleman, 1999b.

[23] PACTS website, www.PACTS.org.uk

Whilst successive government sponsored reports and articles by recognised experts have employed the quantitative approach[24].

QRA: Criticisms

There will greater discussion of QRA and CBA as used in the rail industry in chapters 4 and 5. However a number of general points can be made in relation to its use by experts.

Critics of QRA argue that its use conveys an aura of 'scientific objectivity' on to the decision-making process. Such an approach has attracted criticism from a number of academics, such as Alan Irwin (1995) and Brian Wynne, (1992), who label it the 'Risk Communication Deficit' model, (see above). There has been recognition of the potential problems of concentrating on one methodology and in 1998, the HSE published guidelines on the use of scientific advice which were designed to make the process more transparent and diverse. Such dangers were recognised by the Government's Chief Science Officer,Sir David May, when he called for departments to draw from a greater diversity of sources when making decisions about risk[25]. However, as of 1999, May could only report that:

> I saw only limited evidence that departments have effective procedures for monitoring awareness of, and compliance with the Guidelines.
>
> [May, 1999: Internet version]

This Chapter has outlined the two themes through which the consequent discussion will be framed. It will be shown that the UK Rail Industry has adopted and practised a safety management regime that relies on the principles of the engineering, or scientific approach; using both its

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[24] See for example the work of Sir David Davis on Train Safety Protection (2000), and Professor Evans, chairman of the PACTS rail safety group. Their works and others by experts will be discussed at greater length in Chapter 6.

[25] May, D 'Second Report on the use of scientific advice in policy making: implementation of the guidelines' 1999. DTI.

techniques and language to the exclusion of others. It will also be established though that this approach is undermined by its lack of objectivity and its capacity to provoke argument and discord among experts. More pertinently using Perrow's model of systematic complexity it will be shown that the open nature of the privatised rail industry has served to nullify the scientific approach.

Chapter 3

The Privatisation of the Railways: The Virtual Industry

They sought it with thimbles,

They sought it with care;

They pursued it with forks and hope;

They threatened its life with a railway share;

They charmed it with smiles and soap

[The hunting of the Snark, Carroll: 1876]

The Prime Minister seems to have a particular dislike for railways. She has not travelled on a train since coming to office. Nor does she have any affection for the nationalised industries. So we suffered on both counts.[26]

[Sid Weighell, General Secretary, NUR 1982]

She disliked trains and avoided travelling in them. She regarded them as a dirty and inefficient corner of the public sector, yet one for which the electorate had a perverse affection.

[Jenkins 1995: 203]

The industry was split to its core. It is rather like trying to run a restaurant with the chefs working for one company, the waiters for another and the washer-uppers for a third, all linked through a complex set of contracts and financial relationships overlaid with the threat of fines for inedible food or bad service.

[Wolmar 2001: 249]

The railways have always been political. Can you think of another business that runs through so many marginal constituencies?

[Sir Peter Parker]

---

[26] This isn't strictly true, as she was pictured 3 years later in the British Rail Executive suite en route from London to York. The only other recorded example of train travel was to prove less happy. A train heading for Bristol broke down and a furious PM arrived three hours late.

Before discussing the processes of risk management and regulation in the privatised industry, it is necessary to discuss how privatisation of the rail industry between 1979-1996 changed the nature of the industry and relations between its' constituent parts.

Re-organisation of the rail industry wasn't unique to the 1980s and 1990s. Indeed the literature and the researcher's interviews reveal organisational change happening approximately once every two years since Nationalisation in 1948, (Bonavia 1971; 1981; 1985; Gourvish 1986; Rayner 1993; Maidment 1999). Thus Bonavia writing in 1985 commented that:

> During the three and a half decades since Nationalisation, the railways have seen more changes in their management structures than took place in all their previous history.
>
> [Bonavia 1985: 31]

(Bate, 1990), quotes one BR manager in the 1980s was moved to characterise it as: 'Change, for the sake of change' and 'shaking the bag.'

By 2001, the privatisation of the rail industry remained the last great act of the privatisation process. It was also one of the most difficult and introduced degrees of complication that would have serious implications for the management of safety on the network. It can also be said to be one that continues to unfold. This will be the subject of the following sections which will discuss the moves towards privatisation in terms of Young and Pilkington's categories of privatisation. To reiterate these briefly, they categorise the privatisation process as comprising four main elements:

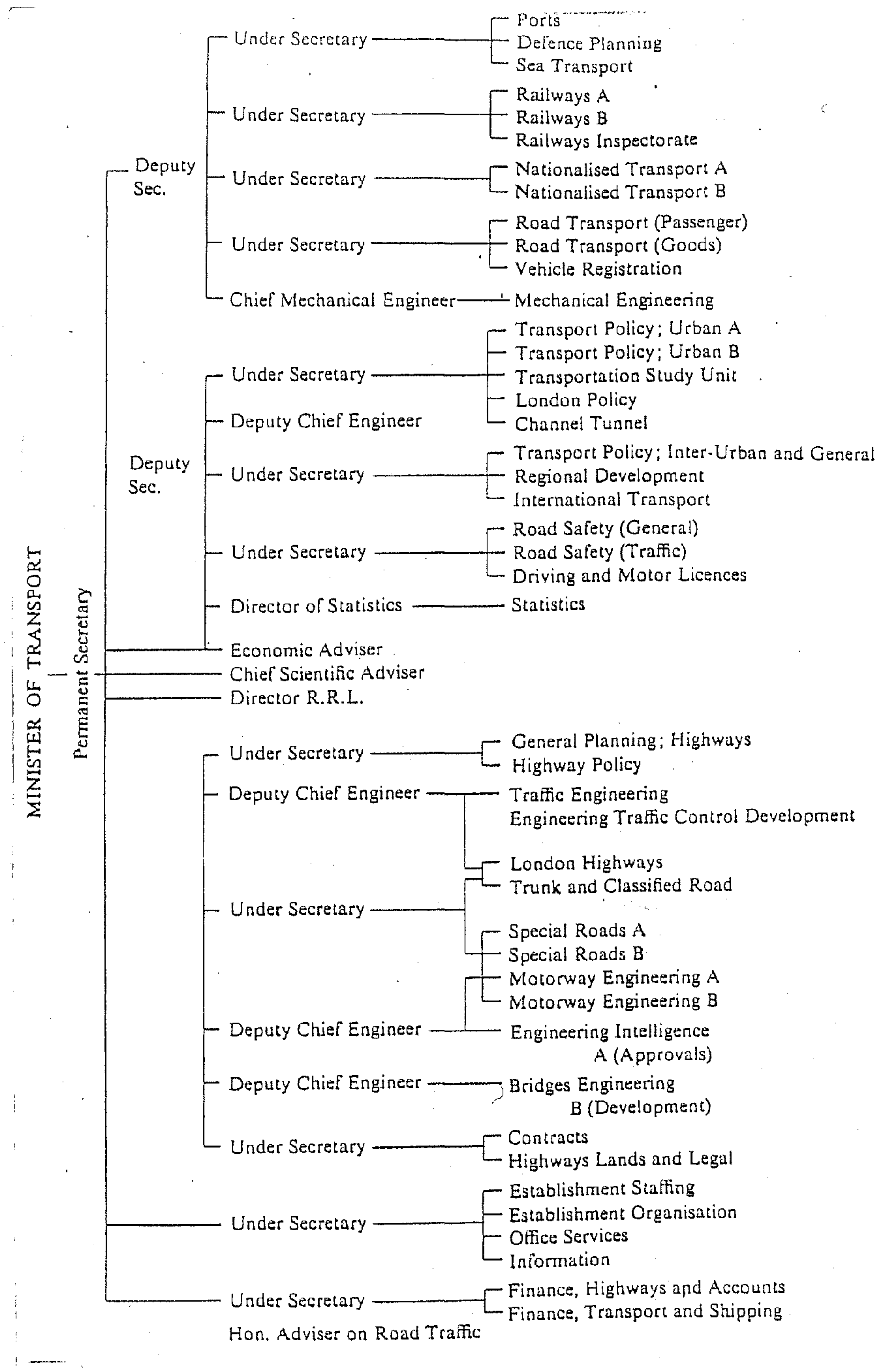
- Opening out core services, including the transfer of power from the civil service to government agencies; involving both civil and industrial services.
- De-regulation to allow the private sector to participate in the provision of services previously monopolised by the public sector.
- The selling of the nationalised utilities and industries so as in order to increase efficiency.

- Contracting out services to the private sector.

The Department of Transport: The Virtual Department

Young and Pilkington's first category involves the de-centralisation of departments, with a separation of policy and operations The department of transport wasn't immune from such changes and comparing and contrasting organisational 'maps' from 1968 and 1996 the two years can best illustrate the transformation.

Figure 2: The Department of Transport 1968



The 1968 Act was an important step along the road to managerialism in the railways. Indeed Beesley (1997) sees privatisation in the 1990s as the logical, if extreme outcome of managing subsidies first enunciated in 1968. However, Whilst the Act represented a step in the extension of the diffusion of centralised control that was happening from the early 1950s, it was still couched in the context of structure and control. The 1968 model is highly stratified and hierarchical in nature, with clear lines of responsibility and reporting control, on the lines of the Weberian mould of bureaucratic organisations. In terms of Railways, there are clearly identified positions whereby ministers and civil servants can exercise control.

The degree to which the Department did control the industry and the form it took are a matter of debate in the literature. The original Transport Act of 1947 which nationalised the railways, did so as part of a nationalisation of all inland transport in the UK; including rail, road haulage; waterways and the docks. As such both Bonavia (1981; 1985) and Jenkins (1995) have argued that the newly nationalised railways operated at 'arms length' via the newly created British Transport Commission (BTC) and Executive (BTE). As Jenkins comments:

> The relationship between Whitehall and the BTE was customarily described as one of 'thankfully giving money and thankfully receiving it.' The relationship between the executive and the old railway regions was much the same.
>
> [Jenkins 1995: 203]

Indeed Bonavia went so far as to argue that the form Nationalisation took distanced *further* the Ministry from the industry. In fact reviewing the period 1947-1985 he concluded that:

> This distancing of the railways from the government, this attitude that, although the railways belong to the state, the state has no responsibility for them has persisted to this day.
>
> [Bonavia 1985: 116]

However, this is overlook the fact from the beginning railways were subject to both direct and indirect financial controls set by central government.

[Bonavia 1981]. Moreover, in his analysis of the relationships between the department and successive BR chairmen a picture emerges of constant conflict and political intervention [Bonavia 1985: 21-40]. Such interventions continued with the creation of the British Railways Board in the 1962 Transport Act.

This created British Rail as a Public Corporation, whose aim was to achieve the principles of business management with the retention of public control and accountability. How this was to be done was through a mixture of direct and indirect forms of control. Thus it was a statutory body, with its' activities prescribed (and proscribed) by statute, with the Minister of Transport's powers designated in areas including power of appointment of directors to the board; pricing policy, employee wages and salaries and investment. In terms of financial management, the 1947 model was followed with its' corporate plans based mainly on the degree of finance given to them by the Treasury. Additionally decisions on major investment projects were subject to control by the Department of the Environment (of which the Ministry of Transport was a part), by statute. These controls allowed the department to be involved in 'as much detail of management as they wish.' [Select committee on Nationalised industry, 1968]. In addition they were intimately involved with annual plans. As the BR Chairman Richard Marsh complained a few years later:

> None of the five year investment plans we have produced has remained intact for more than six months because of the inability and unwillingness of government to settle investment plans for more an inadequate period ahead.
>
> [Marsh: 1974]

Such decisions being at least as much determined by the need by government to influence the economy through manipulation of the PSBR, as by the needs of the industry. Indeed [Spear 1974] argued that:

> Probably the most important motivate behind the intervention is the government's tactic of varying investment levels to manage the national economy in the short term.
>
> [Spear 1974: 23]

Marsh (1978), explained the rationale for such intervention:

The Permanent Secretary of the Ministry is directly and totally answerable to the Public Accounts Committee for the expenditure of all monies voted to his department. In a loss making industry a strange situation arises, therefore, [where] he and his colleagues get involved because of political pressures. What, under one set of statutes, seems to the [BR] board political interference is, from the Permanent Secretary's view point, the legitimate discharge of his responsibilities to Parliament.

[Marsh 1978: 164]

By the early 1980s there were 14 graded Principal staff oversaw British Rail. [27] The framework for BR operations was set by a combination of the BR management, the Department and the Treasury. Additionally, BR was set a mixture of financial and public obligation targets; some of these were quite specific. [NAO 1986; Gourvish, 1990]. Whilst performance indicators weren't made public the Department required BR to publish performance at the higher level of the organisation, which in 1984-5 amounted to 38 separate indicators. The aim being to spur on the management [NAO 1986: 18-19].

This degree of interest in the running of the railways led to a problem of recruiting senior staff. As Parkinson reflected 15 years later:

The government had head hunted 45 executives for the post at BR, but they all refused because they would get the blame for the consequences of Treasury decisions and their interference over investment and fares policy.

[Parkinson 1999][28]

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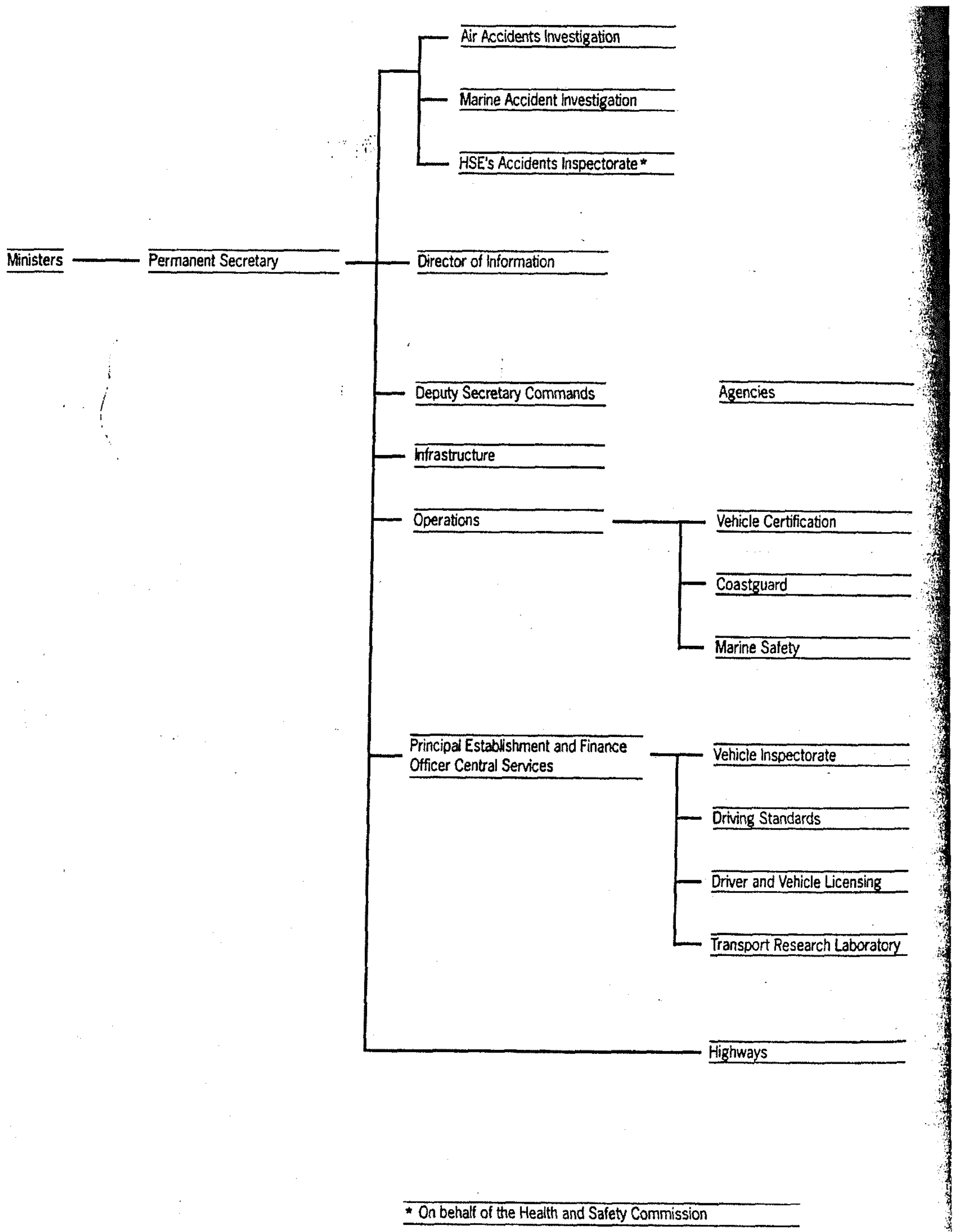
[27] National Audit Office 1985 p 15

[28] This search was also compromised by an inherent attitude that high fliers wouldn't want to be in railways or as Cecil Parkinson said: "No one any good wanted to run the railways". Also Welsby: "Thatcher said that if any of them (BR) were any good, they wouldn't be in the public sector." [BBC, Rail Sale 1999]

By contrast, to 1968 model, the 1995 model reveals a picture much changed; both in terms of size; range of responsibilities and structure.

Figure 3: The Department of Transport 1995



The language too had changed, with them talking about it's functions in terms of 'sponsoring' 'overseeing' and 'regulating', rather controlling, or being responsible for transport in the UK. [Civil Service Yearbook 1995: 611]. This was reflected in the 1993 Railway Act, which prompted a significant transfer of decision making away from the Secretary of State to governmental agencies attached to but not controlled by the Department. Thus while the Secretary of State's responsibilities remained theoretically extensive and identical to those of the rail regulator, the operational power was divorced from both Minister and Department.

Thus responsibility for issuing and regulating operating licences to train companies was left to three QUANGOs[29]: the Office of Passenger Rail Franchises, (OFPRAF); the Office of Rail Regulator (ORR), and the Health and Safety Executive (HSE), in the form of Her Majesty's Rail Inspectorate (HMRI). Subsidies to the industry were channelled via the Franchise Director at OPRAF, who like other regulators was appointed by the Secretary of State of the relevant department, (see below) and without reference to the Departmental structure. As Joy summed up:

> Between them OPRAF and the Regulator become *de facto* strategic managers of the British Rail System. The Government's responsibility will be limited to meeting the cost of the required subsidy.
>
> [Joy 1998: 43]

If Privatisation had transformed how politicians and civil servants administered the railways, the process itself was to be similarly affected.

The 'Privatisation' of the British Rail: The Virtual Industry

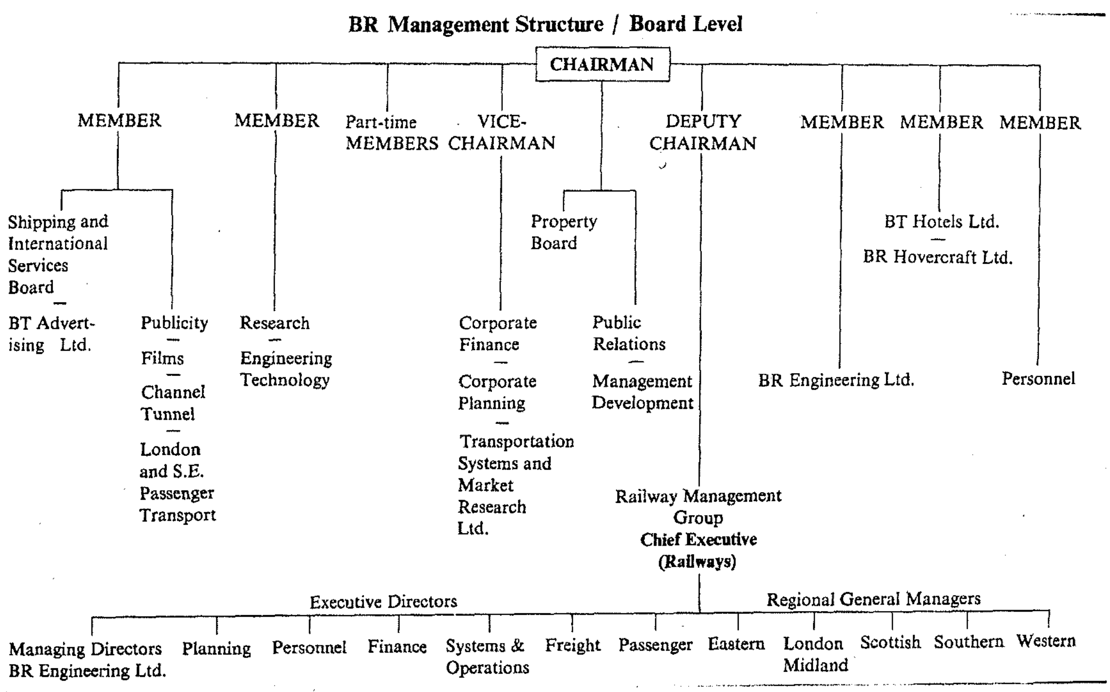
If privatisation created a virtual Department responsible for transport, it also created a virtual industry within the rail system itself. Aware of the criticism that had accompanied the sale of British Airways and British Gas as private monopolies, the sell off of BR intact was never a serious possibility. [Sheldon 1997; Parkinson; Waldegrave 1999]. This despite being the BR

---

[29] Although only the HSE appears as an officially recognized NDPB or QUANGO in the Cabinet office publication: Public Bodies.

Board's preferred option, [Welsby 1999]. In fact, the Major government went to the opposite extreme and British Rail was dissolved into an industry of over 100 separate organisations bound together not by a single command structure but by contractual relationships/obligations. Such a structure was to have profound implications for the operation of the rail system and the regulation of its safety performance. This transformation can be again be illustrated by reference to organisation maps of the industry in 1968 and 1999.

British Rail in 1968



The 1968 map presents an apparent monolithic structure, with lines of control from the centre. Again the literature paints a picture of a highly centralised bureaucratic approach. Thus Carter (1992):

> The organisational structure reflects not so much a heterogeneity of products as the sheer complexity of operating a large railway network…[arising] from the enormous degree of interdependence that is inherent in planning and operating the railways.
>
> [Carter et al 1992: 141]

Horbury (1996) makes a similar point in her characterisation:

> British Rail...was a highly centralised formal bureaucracy which was reflected in a complex and extensive hierarchy, with considerable attention to rules and regulations and a rather rigid and autocratic style of management.
>
> [Horbury 1996: 90]

In fact BR was a four tiered structure of headquarters, region, division and area; representing a hybrid mixture of function and geography. At the central level, lay responsibilities for central planning and control including finance with the Government providing subsidy; research; industrial relations and procurement. However the actual running of the railway was devolved to five regions; each of which enjoyed considerable autonomy in operating services and maintaining the infrastructure in their area. Within them there were further subdivisions based on function and area. As such they were the linchpins of the system [Gourvish 1990]. In fact there were the remnants of the pre Nationalised industry of the 'Big Four' companies [Spear; Nash & Preston; Gourvish]. The transformation from the early 1970s to the present, (2001), has involved all four of Pilkington / Young's paradigm of privatisation, This included the sale of assets; the increasing emphasis on managerial principles and the introduction of private sector practices and principles; and latterly the introduction of contracting out operations with passing of the 1993 Railways Act. The process culminated with the floating off of Railtrack as a private company in 1996.

Selling off the Assets

Selling off assets at first meant the sale of what were regarded as non core activities, such as catering and Hotels, but by 1996 was to include the very heart of any rail system: the infrastructure itself. Before 1993 sales were concentrated on the so-called non-core activities, such as Hotels and shipping. These were sold off as part of the general auction of the 'family silver' undertaken by the Thatcher administration, (see above).

At first BR initially didn't intend to sell them off entirely. Rather they aimed for a public-private partnership in order to inject investment, whilst reconciling this with the Conservative government's concern to reduce its expenditure on the railways. This concern to retain control of assets changed in 1980 when the government created the British Rail Investments Ltd, which became a vehicle by which BR could transfer activities prior to full scale sell offs. The first major sell offs were British Transport Hotels; Sealink; and Hoverspeed.[30] Following these essentially peripheral businesses emphasis shifted to the engineering division.

This was done initially by opening out the provision of rolling stock to competitive bidding. This proved to be successful for private companies and by 1988, they accounted for 53% of total orders for locomotives and coaches. In 1987 the engineering subsidiary, British Rail Engineering Ltd (BREL) was broken off and sold off. The Empire was beginning to crumble.

1993-1996

If the 1980s saw the beginning of the sell offs they remained essentially concerned with non-core activities. Indeed Jenkins points explicitly to the comparative lack of zeal shown by successive Thatcher administrations to privatising the railways - something caused by a mixture of caution and dis-interest. As he stated:

> 'Trains rarely leave politicians in one piece. Thatcher knew this.. She wanted to cut the cost without frightening the natives'
>
> [Jenkins 1997: 203]. [31]

To this end, not only were privatisation initiatives headed off, [32]but also within British Rail, the regional managers retained significant control of

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[30] Indeed, although insignificant to British Rail as a whole these businesses represented major components of their respective industries, and Gourvish regarded their sales as prototypes for the major privatisations that followed after 1983. [Gourvish 1990: 140]

[31] This didn't stop right wing think tanks, such as the Adam Institute, coming up with all kinds of outlandish schemes. Most (in?) famous of all perhaps was the proposal from the Centre for Policy Studies to rip up the rails and open the routes to buses and cars. [Marsh 1978; Harris 1997]

[32] One example was as late as October 1990 - only weeks before her Political nemesis - when she instructed her Transport Minister, Cecil Parkinson to remove any

operations, infrastructure and support services. By contrast, the years following the 1993 Rail act was to see the rapid disintegration of the old system, with 61 BR businesses sold off in three years. This included all freight operations; all infrastructure maintenance and renewal operations, which were re-organised, and eventually sold off to private firms such as Balfour Beatty. (This being a specific requirement of the 1993 Act.) But the principal act of selling off was the flotation of the infrastructure itself with the privatisation of Railtrack in 1996.

Railtrack: 1993-1996

The 1993 act's principal impact was to separate off the operation of train services from the ownership of the infrastructure in the form of the track, signalling and stations. Whereas the services was fragmented and franchised out to competing companies, (see below), the latter was to be owned by a specially created Government company. An idea of the scale of the operations can be gauged by referring to the table below.

Miles of Track	20,000
Route Miles	10,000
Leased Stations	2,500
Major Rail Stations	14
Bridges, Viaducts, Tunnels	40,000
Level Crossings	9,000

Source: Railtrack quoted in Harris & Godward

The company's assets amounted to £4,284m and employed over 11,000 people including 6,600 signalling and supervisory staff. Initially at least, the intention was for Railtrack to remain in the public sector albeit one constructed and acting on commercial lines. To this end it was specified that

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references to privatisation from his speech to the party conference. He refused, stating that privatisation of BR was a 'question of how and when.' [Radio 4 30/11/99].

it should receive no direct subsidy from the government, but that it should generate its own income by charging train operators for access to the track and from leasing stations from private companies. The principal object of raising monies would be to fund the maintenance and renewal of the rail network at an 'appropriate level' [33] in conjunction with train operators and the Franchising Director, OPRAF. The contract railway had been created.[34]

The privatisation of Railtrack wasn't mooted in the 1993 Act although significantly Railtrack as an entity wasn't referred to either, implying a degree of latitude for the Secretary of State.[35] It was only clarified as being a 'Government Company' at the bill's second reading.[36] Whenever privatisation was discussed it was assumed that it would be at some unspecified point in the future, and certainly after the licences for train operations had been settled. It was the failure to settle these quickly and the prospect of a Conservative defeat at the following election that brought the issue forward. Barely 18 months after it had been discounted for at least ten years, Railtrack was floated in 1996.[37]

Such concerns led the Department to revert to selling it off *en block*, much in the way British Airways had been sold, even though a central aim of rail privatisation had been to avoid the creation of private monopolies and to encourage competition.[38] The option of retaining a 'golden share', or some influence in the company was rejected on the grounds that it might have spelt

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[33] Letter from Secretary of State, John MacGregor to Select Committee on Transport, February 2nd 1993

[34] This method prompted the Select Committee Report on the Future of the Railways to brand the new arrangements, not so much 'Privatisation' as 'management by contract' para 28, xxxvi

[35] Transport Select Committee on s HC246-I, para 172, lxv.

[36] Op Cit, 5.

[37] John MacGregor, House of Commons debate 24.11.94

[38] See: New Opportunities for the Railways 1992. HMSO

a lack of confidence in the Government's ability to achieve sufficient demand for a 100 per cent sale. There was also the thought that if they retained a residual share it might affect investors' confidence about Governments exerting influence over the company. Also there was the concern that a phased sale would not have been achieved and that there would have been a very real risk of the sale failing altogether. The other motive was political. Where Mrs. Thatcher had been disinterested, her successor John Major, was positively enthusiastic, seeing it as a continuation of her philosophy. [39] Also, as with the 1980s sales, the prime aim was to create a situation where any future Labour Government would find it almost impossible to re-nationalise. For this to happen, the heart of the system had to privatised and privatised quickly. As Welsby said;

> The Treasury said money didn't matter.....the priority was to complete privatisation in one Parliament.
>
> [Welsby 1999]

According a 1998 National Audit Office report, the strategy and the haste with which Railtrack was sold off, led to an under valuation of shares and a cumulative loss of anything up to £4bn.[40] Rather it should, in their opinion have been delayed. [41]It was indeed very much a political sale. [Harris & Godward 1997; Jenkins 1997; Dorrell, Parkinson, Welsby 1999].

Managerial Principles

The second element of Pilkington / Young classification of privatisation involves the introduction of managerial principles. As can be seen from the

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[39] According to Stephen Dorell, the then Secretary to the Treasury "John Major was responsible for privatisation. He saw it as a continuation of Thatcher's philosophy." BBC Radio 4 30/11/99.

[40] This is based on a number of assumptions including a comparison of the sale price of £3.90 a share in March 1996, as against the July 1998 price of £16.05. Also it supposes that the Government could have sold off shares gradually and retaining a 40% share in the company. National Audit Office, 1998. A further £1.2bn of the old BR's debt was also written off.

[41] NAO, 1998, p. 4.

beginning of the chapter, this has been the underlying rationale of all reforms both in central government and in what were the public utilities. Also it can be seen that managerial principals were nothing new in how the Railways were run before the 1993 Act. In the railways this was manifested in the various re-organisations that aimed to place the business culture ahead of the traditional 'railway culture' and by the use of performance indicators.

Re-organising for Business

Horbury (1996) points to the plurality of forces and cultures in British Rail pre 1993 stating that it was 'managed through the maintenance of a rough and ready order based on agreement between many different interest groups.' [Horbury 1996: 89]. Her study along with Bonavia and Gourvish's research among others pin points the tensions that existed between what has been referred to as a 'railway' culture based on engineering and a 'business' culture, based on profit[42]. Bate (1990) characterised it in terms of segmental rivalry split as being between:

> The valued service ('value for money' / the social railway, the other side the 'profit' service ('money for value' / the commercial railway)
>
> [Bate 1990: 121]

Further:

> The roots of this 'divided attitude' are historical: there is a long record of segmental rivalry between various departments and professional groupings within the railway.
>
> [Bate 1994: 107]

These factions came to a head in the 1980s, with organisational changes that were dubbed a managerial and marketing revolution. As Maidment (1999) states:

> Beeching changed the military culture to one where there was a notion of financial direction and accountability. In this sense, the Beeching era could be seen as a financial revolution. The 1980s saw a managerial and marketing revolution.
>
> [Maidment 1999]

As Bate concluded:

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[42] See also Gourvish, 1986.

During the 1980s culture and counter culture fought it out as the old guard in 'production' clashed head on with the young Turks in the 'Sectors', each parading before each other ideologies and styles of thought which they knew to be provocative and unacceptable.... Stand up arguments became commonplace among heads of departments.

[Bate 1994: 107-108]

Jenkins (1997) characterised this period as 'war' and that such was the enmity that no managers on the 'losing side' gained future promotions.

(Such a clash was to be replicated inside one of the rail regulators, the HMRI, in the 1990s, see Chapter 5).

Defeating the Railway Culture

Commentators have criticised the Railway culture and likened it to a military style. [43] Others have gone further, comparing 'railway men' unfavourably to monastic orders in their insularity. [44]This proved to be not just a barrier to progress, but an actively negative aspect of British Rail's attempts to be commercially successful. [45] As Gourvish concluded of the period pre 1982:

Another constant element, which proved very difficult to change, was a "culture of the railroad" erected on a century and a half of the public-service concept....The culture was more than simple inertia....but made railway people suspicious of outsiders (especially of senior executives from the private sector.

[Gourvish 1990:113]

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[43] See for example Gourvish 1986, Bate 1990, Horbury 1996, Jenkins 1997, Maidment, 1999.

[44] Speaking in the 1960s, Fiennes characterised railway men as: "An enclosed order far worse than the Benedictines.. they're inbred, inward-looking, they've got plenty to do looking after the railways." [Gourvish 1986: 337]

[45] Gourvish (1986), summing up the period 1963-1973 when managerial principles were introduced comments that "it was the culture of the railroad that had to change, rather than the organisation.

Bonavia stressed the special position enjoyed by engineers and could report as late as 1985 that they regarded themselves as part of a line tracing back to Stephenson and Brunel. [46] More pertinently, the Railway Civil Engineer enjoyed a position that other managers had lost in terms of independence of action and autonomy. As Bonavia stated:

> In the team of regional departmental officers, he is still often able to lay down standards which are less easily questioned than the policies of his colleagues, partly because he can always play the trump card, his responsibility for the safety of the line.
>
> [Bonavia 1985:41]

The potency of the Railway Culture was based on the continuing importance of the regional tier of management. Even in the 1980s, they retained characteristics and attitudes of the pre-nationalised companies. Jenkins [1997] described them in the 1980s as: ' the last outposts of a liberal empire in its final years of decline.' Each had their own idiosyncrasies where pre-war practices still prevailed, (including engineers in the Western region who still used Brunel's drawings as a basis as part of their work)[47].

The impetus for reform based on managerial principles came with the chairmanships of Sir Peter Parker and Sir Robert Reid. Under their stewardship, in 1982 BR was divided into five individual business sectors designed to change the balance of power between 'management' faction and the engineering faction by downgrading the position of the regional tier of management. The new businesses were based on a mixture of function and geography, being Freight; Parcels; InterCity; Provincial; and London & SouthEast,[48]and were headed by individual directors responsible to the Chief Executive. In this scenario regional managers were downgraded and instead

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[46] Accordingly, each newly appointed engineer in the Western region were presented with Brunel's 'walking stick' 'with its "ingenious aids to surveying which the illustrious builder of the GWR took with him on his countless journeys. [Bonavia 1985:41; also Jenkins 1997: 203]

[47] Op Cit 17, p. 203.

[48] Later to become Network South East in 1987.

of being responsible for delivering all activities within their regions, were now answerable to the Sector Directors by delivering a service dictated by contract. Operations were dictated by contractual arrangements made between sub sector managers and operating areas to a specified level and quality of performance at specified cost. [Nash & Preston 1993]. These moves strengthened the hands of managers in that it clarified lines of control and increased control over assets within their sectors. They could also specify performance targets within financial limits. The contractual culture had entered the railway. However, the regional tier still existed and this still gave rise to further conflict between the factions. This was to be resolved by the introduction of the last great re-organisation of the old BR: Organising For Quality, (OfQ).

Organising For Quality

The final nail in the coffin for the regional system came with the policy of centralisation known as 'Organising for Quality', (OfQ). This abolished the system whereby the planning, marketing and infrastructure maintenance was operated in regions. Now total control of all managerial issues was devolved to the sectors, whose director was responsible for all aspects of operations, reporting to the BR Chief Executive. The principles behind the restructuring were for introduction of transparency and accountability in running the railways by simplifying structures and lines of responsibility. As Reid commented to the Select Committee in 1993:

> (OfQ) allows us to identify individuals who are running segments of the railways...One person is responsible for running that railway with all the resources under his command to make sure that the service does operate.
>
> [Reid 1993: q155]

OfQ also represented another move away from the production side of the railway towards the marketing/ managerial faction. By doing so, it was intended to concentrate on the passenger's (now called the customer) needs in line with the Citizen's Charter.[49] This was most notably expressed by the

[49] Reid (1992), q158.

adoption of the TQM philosophy[50] which defines the degree to which a service or product's specification in terms of 'zero defects' (Wilkinson 1993); with increased emphasis on meeting the customer's needs, [Bartol & Martin, 1998: 546]. In BR this took the form of the increasing adoption of performance indicators, aimed at customer-centred issues and away from financial and 'efficiency' issues that had characterised the production led culture. Thus Maidment:

> In the early 1980s BR's priority was to cut costs and this had led to a failing in the service as regards punctuality and reliability. My job was to use quality management tools to persuade BR that punctuality and reliability would be a positive aspect of the business.[51]

Thus in 1989, BR's management introduced a Passenger's charter aimed at enunciating obligations and targets to their newly labelled 'customers'; providing refunds if certain targets weren't met. Performance Indicators were to become the essence of the post 1993 industry; based as it was on contractual arrangements (see below).

The logical conclusion of the adoption of such private sector principles was to be expressed in the 1992 White Paper, which declared unambiguously that in any future railway system the passenger/customer was to be supreme. Thus:

> The principle objective of the Government's proposals for the privatisation of the railways is to improve the quality of service for rail customers, both passengers and freight. Private ownership can achieve greater flexibility of response, efficiency of operation and sensitivity to customer needs.
>
> [Department of Transport 1992]

The result of the OfQ initiative was that the 'war' between the regions and the businessmen was over, with the business culture the winners. Whilst it aimed to decentralise and devolve control to identified sectors, the chain of command was clarified and strengthened with individual directors directly

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[50] Maidment, 1999. An approach later to be followed in assessing the safety needs of the newly privatised industry. See Chapter 6.

[51] Researcher's Interview with Maidment, D, 31/10/99. Also, Carter et al 1992; Pendleton, 1993.

responsible to the BR Chief Executive. Moreover, the engineering functions had been integrated into the business sector. On the front line, Harrison-Mee (1992) saw it as the defeat of the four ogres of the old railway culture. Thus:

- Operators who always knew they run a railway, if only passengers didn't get in the way.
- Engineers who could maintain a perfect railway, as long as operators didn't run trains on the track
- Rolling stock engineers who thought that the only way to make a train reliable was to avoid any innovations such as air conditioning
- Signal engineers who believed that the only safe train was one waiting at a red light.

[Harrison-Mee 1992: 368]

The effect on safety was to sideline it as an issue for management. Maidment again:

> The 1980s saw a managerial and marketing revolution; one which downgraded the importance of engineers. Engineers had been traditionally charged with safety matters and this placed them in a defensive position vis a vis the marketing side. Safety had always been seen as primarily the responsibility of the engineering and production departments, as management delegated safety responsibilities to the engineering departments. The consequence of this was that safety issues were sidelined and there wasn't any significant progress in it in that period "Safety wasn't going forward, it was trying to maintain its ground." Safety didn't need an especially extra effort.

[Maidment 1999][52]

Contracting Out

The final element of the Pilkington / Young paradigm is the use of contracting out in activities that had previously been undertaken 'in-house'. In this respect this is where privatisation had the widest impact on the public sector. Following 1979 there was no area of public sector activity, or institution that wasn't involved; including central government departments; agencies; local government; armed forces; police and the NHS. Developments in the

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[52] These statements taken as part of an interview with the author are similar to remarks made in Maidment [1995:2] (Although there they are expressed more circumspectly.)

1980s were given impetus by the 1988 Competitive Tendering Act. For example in Local government the value of services contracted out rose from under £50m in 1989, to nearly £2,000m in 1992. [NAO 1995: 6].

In the 1980s, contracting out for BR was mainly confined to putting engineering work to tender prior to selling off those subsidiaries, (see above).[53]

However the 1993 act was to transform this situation with both train operations contracted out and maintenance of the infrastructure.

1993-2001

> The 1993 Act didn't privatise the railway service. It sold off its assets and transferred control of them to a bureaucratic framework of complex internal contracts.......Control of what had been a unitary but devolved industry was brought under close Whitehall oversight, both as subsidy and as to regulation. The 1993 Act threw the railway up in the air and ensured that it fell straight into the Treasury's lap.
>
> [Jenkins 1997:212]

The 1993 Railway Act confirmed Government intentions for the future rail system to be operated, if not owned by the private sector. Such involvement would lead to an improvement in passenger services, based on competition and a perceived ability of the private sector to respond more readily to customer needs.

As has already been seen, in the period between 1979-1993, BR was subject to all the forms of privatisation proposed and executed during that time, and each one served as a preparation for the 1993 Railway Act, that would change forever the structure and ethos of the rail system. It's principle legacy would be to create a picture of a highly complex industry, bound together not by traditional bonds under one organisation and vertically integrated, but by a series of agreements and contracts regulated by civil servants. This is the subject of the last section in this chapter.

The 1993 Act: The Contract Industry

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[53] Even 'TravellersFare' survived the process largely intact. Possibly belying the jokes about the quality of BR sandwiches!

"The railway was ripped apart at privatisation and the structure that was put in place was a structure designed, if we are honest, to maximise the proceeds to the Treasury. It was not a structure designed to optimise safety, optimise investment or, indeed, cope with the huge increase in the number of passengers the railway has seen."

[Corbett 2000]

"If you kick the guts out of your staff and the structure of the rail company, you lose experience and it was experience that kept the ramshackled system together."

[Dunwoody 1999][54]

How the core rail services were to be privatised had been a matter of debate since the 1979 election with reports from various right wing 'think tanks' being published. However none of the various options that were considered, including the sale of BR as an entire entity, had attracted wholesale agreement.

Meanwhile British Rail management had become increasingly frustrated by the constraints placed on them by the nature of being a nationalised industry. They collaborated with Kenneth Irvine on the production of the paper: "The Right Lines." This was published by the Adam Smith Institute, and advocated a separation of functions between maintaining track and operating trains.

This idea of fragmenting the industry was adopted by the three Government ministers charged with preparing a brief for privatisation: Roger Freeman, Minister of state for Transport; John Redwood (DTI); and Francis Maude at the Treasury. They prepared a plan based on a paper that had appeared 3 years earlier by Kevin Irvine and Irvine was invited to present his ideas to the Conservative Manifesto committee.

By contrast, the BR plan concluded that it couldn't be privatised in a decentralised form. Only privatisation as a whole entity would be practicable i.e. if it was floated off, like British Airways.[55] Government aware of the criticism that had accompanied such monopoly sell offs rejected this.

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[54] Chairman of the Select Committee on Transport.

[55] British Rail evidence before Select Committee, 4/11/ 92. Welsby, 1999.

It was left until after the 1992 election to introduce legislation on the matter. The resulting bill, based on the 1992 White Paper, 'New opportunities for the Railways', marked the beginning of the privatisation process in 1993.

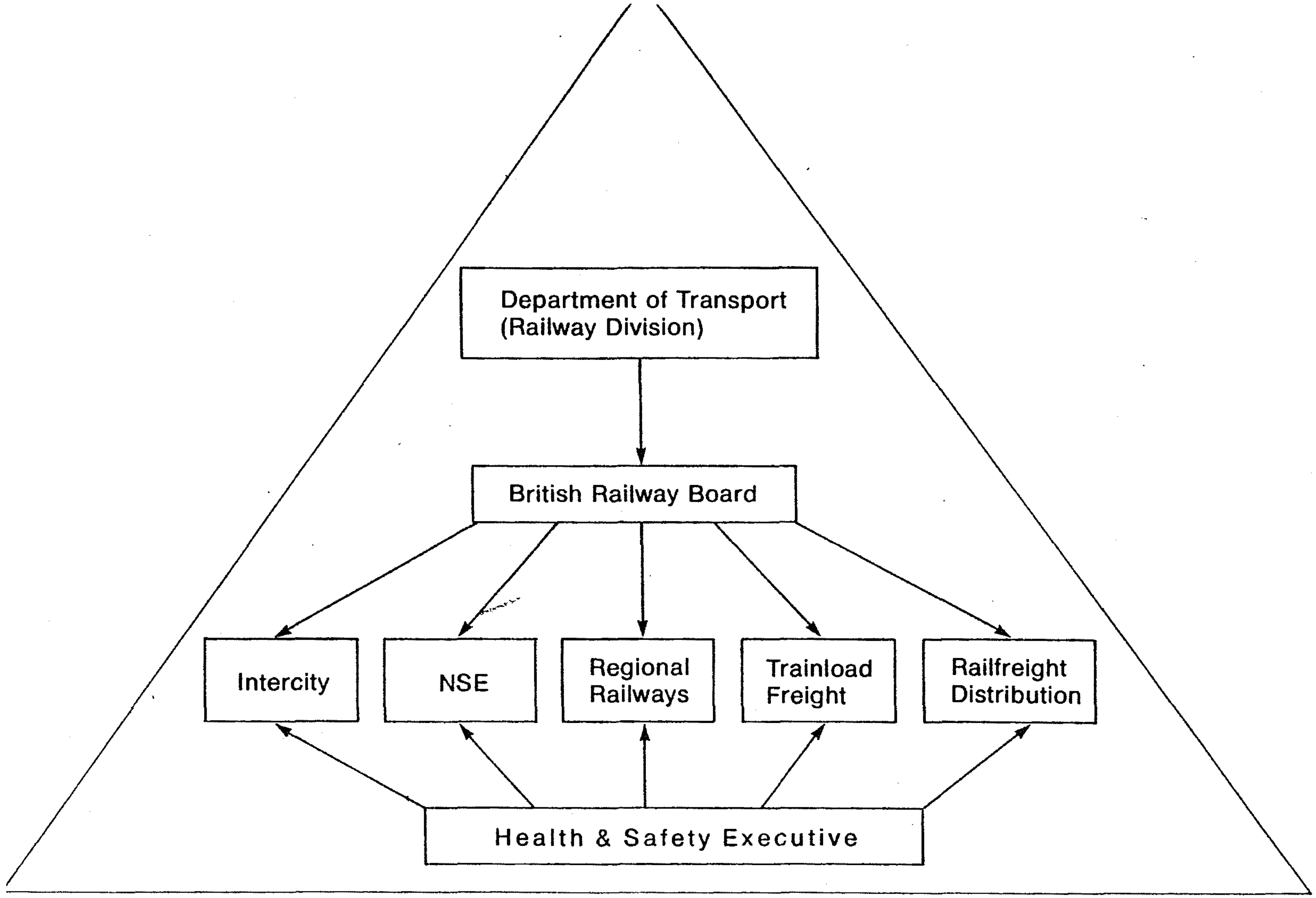
. Specifically, the act proposed that the old BR should be split into three main sectors, the network's infrastructure, train services using it and freight services (these were to be sold off completely.

The key feature of the post 1993 Act was that it was no longer a vertically integrated industry, but one based on contractual arrangements between over 125 disparate organisations[56]. Again the changes can be seen with reference to organisational maps before and after 1993:

Figure 4: BR MAP Evidence to committee pre 1993

[56] Green (2001)

Figure British Rail before 1993



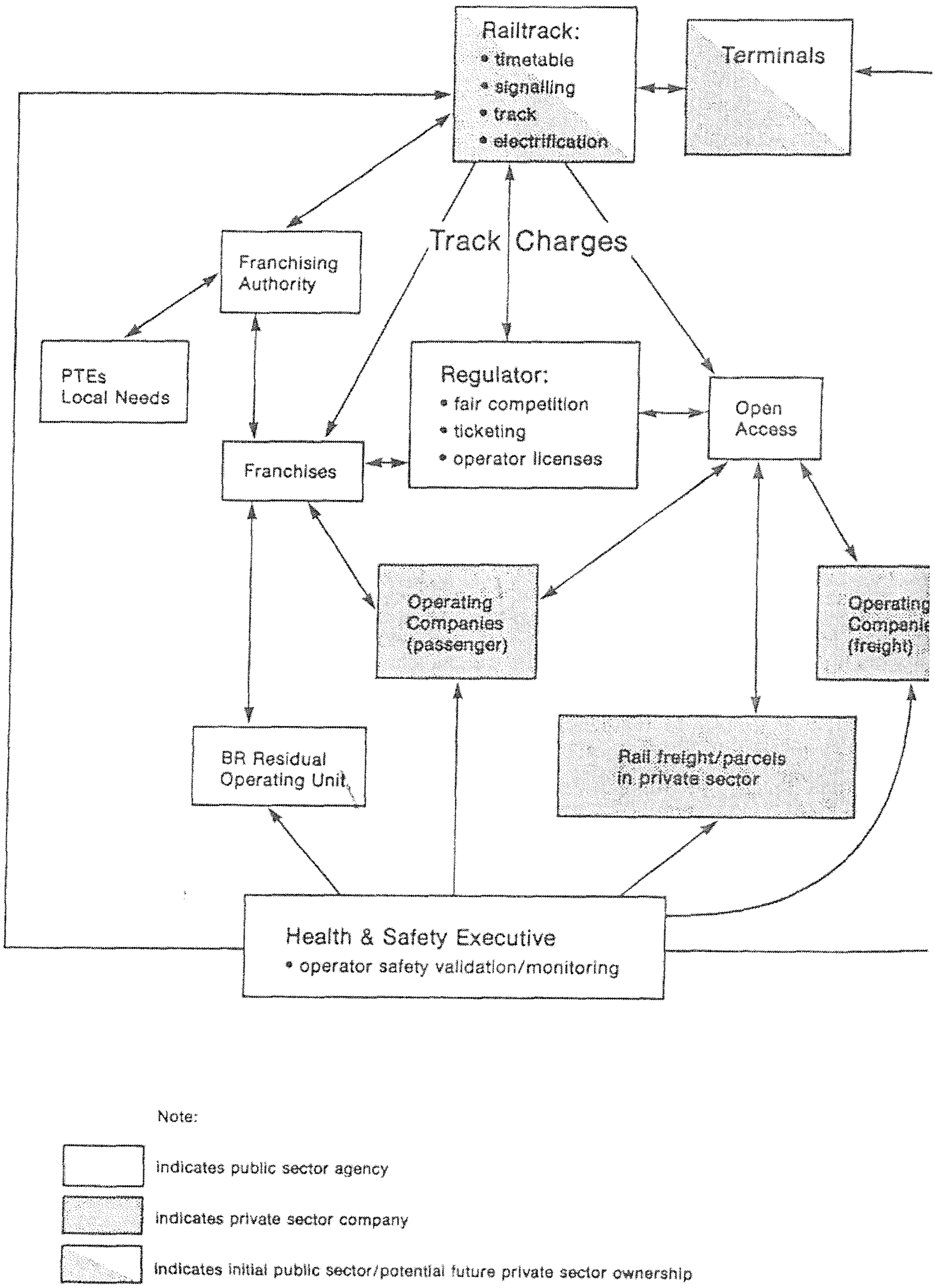


Figure 4: The industry after 1993 Act

The two diagrams couldn't represent a greater contrast. The situation pre 1993 was of a vertically integrated industry with direct lines of responsibility and accountability from the Department downwards.

Responsibility for operations was devolved to the BR Board, who organised operations into the 5 main segments. Within and between these organisations there was direct accountability to the Board, (see above). In the post 1993 map the industry was no longer a vertically integrated industry and many of the elements of running passenger services including, rolling stock; track; stations; train operation involved commercially negotiated contracts. Relationships between the constituent parts of the industry were fragmented and diffused and complicated with service provision and lines of accountability based on contracts. As Welsby commented:

> The fundamental difference between the Government policy and what I did was that command structure is now replaced by a contractual structure, in which different players in the new system will be relating to each other through contractual bases....It could become a playground for lawyers and all sorts of things.
>
> [Welsby 1992: q158]

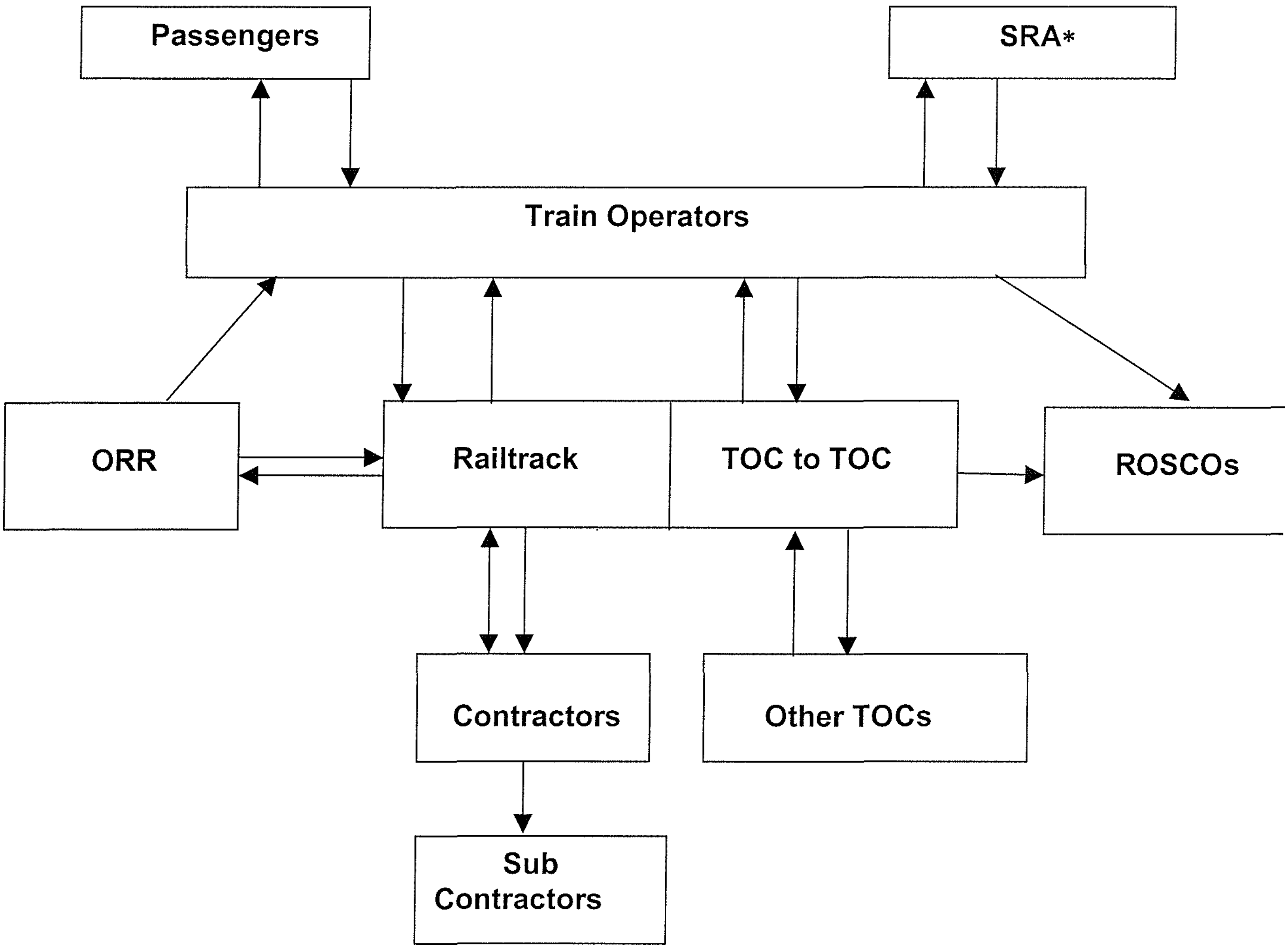
In summary, the 1993 Act created the following:

- Railtrack, a monopoly maintainer split into seven geographical zones
- 25 Franchised Passenger train operators, (TOCs),
- Unregulated passenger Companies such as Eurostar.
- Open Access Operators, that operate without franchise. For example the Heathrow express.
- Non passenger operators, e.g. Freight operators.
- 3 Rolling stock Leasing Companies , (ROSCOs)
- Infrastructure Maintenance Companies.
- Sub-contractors working on the infrastructure.
- Suppliers of goods and services to ROSCOs and track renewal firms

Additionally there was the creation of two new bodies to regulate their activities, the office of Rail Regulator, ORR, and the Office of Rail Passenger Franchises, OPRAF. [57]

The most obvious example of fragmentation was the separation of the ownership of the rail infrastructure and the operation of train services on it. Railtrack was to own and maintain the railroad and the national train service was divided into 25 'Train Operating Companies' (TOCs). The contract nexus can be illustrated thus:

Figure 5:Contractual Relationships



[57] Note that after 2001, OPRAF was replaced by the Strategic Rail Authority, or SRA. See Chapters 6 and 9.

*Until 2000, OPRAF

The full complexity of the contract industry can be illustrated. At the front end of the system, TOCs are responsible for providing services to passengers under the Passengers' Charter, monitored by the ORR, and via the agreements with OPRAF (after 2001, the Strategic Rail Authority, SRA). Within the industry individual TOCs have contracts with the infrastructure provider, Railtrack, and other TOCs and the Rolling stock companies, ROSCOs. Railtrack have agreements with TOCs and infrastructure contractors. These relationships are the subject of the next section.

The Train Operating Companies

The chief element of the Act was the contracting out to private companies of the right to operate train services on the network. This was to be done by creating and awarding franchises to run services for a specified area and over a specified length of time. These were awarded by a new regulatory body, the 'Office of Passenger Rail Franchising' (OPRAF)[58]. This was created as a non-ministerial governmental body, headed by an independent Franchise Director who was a Department of Transport official, or civil servant, appointed for 5 years. His task was to identify those areas of railway activity eligible for funding and to invite tenders from prospective operators and negotiate their terms.

Since OPRAF was responsible for awarding the rail franchises, or contracts, TOCs were responsible to them for meeting agreed targets and standards of performance on various issues, for example, reliability or punctuality. These were classified under the 'Passenger Service Requirement, (PSR) which stipulates minimum standards of performance. These were particular to individual franchises and if these weren't met, OPRAF could levy fines and/or withdraw the franchises. This reflected one of the aims of OPRAF to promote, or secure 'overall improvement in the quality of passenger services' [HOC 96/85]. In return, OPRAF was made

[58] After 2000, OPRAF's role were taken over by the SRA.

responsible for disbursement of public subsidies and monitoring the companies' performance in terms of reliability of service and punctuality. An additional series of performance and provision contracts were taken out with Passenger Transport Executives, (PTEs), who provided subsidies for passenger transport in designated connurbations, such as the West Midlands. As implied these related to performance in specified areas. But the awarding of franchises was also dependent upon the ability of companies to perform to the standards on the basis of least cost to the Treasury. Thus the Department of Transport reported to the 1992 Select Committee:

> The Franchise Authority will be letting out franchises on highest premium or least subsidy basis.
>
> [DoT Memo 20/10/1992]

Moreover they were awarded on the basis that the subsidy would be reduced progressively over the lifetime of the franchise. [59] This was set in the context of OPRAF/SRA's ability to regulate the TOCs' other major source of finance: fares. Thus the TOCs ability to raise fares on designated categories, such as commuter services was curtailed. From 1996, increases in such fares were held at the Retail Price Index, and from 1999, at 1% *below* the RPI. This created a tension between least cost and maximum performance was designed to spur TOCs to greater efficiencies, but it has been posited that it also gave rise to a conflict between performance and safety. (See Chapters 8 & 9).

But the TOCs had an extra independent regulator to answer to, the Rail Regulator. Under the 1993 Act, the Office of Rail Regulator, (ORR), had a much more wide ranging brief. If the Franchising director had direct input into awarding franchises, the Rail Regulator is responsible for granting licences to passenger and freight operators as well as to Railtrack. All rail operations need licensing and the ORR sets and enforces conditions for such licences. As such s/he sets the legal and economic backcloth in which

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[59] The estimated figure being a net reduction in subsidy to the system of £200m by the end of seven-year franchises.

the franchises operate. This involved above all the promotion of competition designed to achieve economic efficiency and to deter practices likely to lead to an abuse of monopoly supply/provision. [60]

More specifically, s/he is also with issues concerned with passengers' concerns; including ticketing; the upholding of the Passenger Charter; and issues connected to forming and running the national timetable.[61]

Whilst OPRAF/SRA and the ORR are independent of each other and constituted separately, their responsibilities overlap in several areas. This has lead to a situation where there has been considerable confusion about the nature of each body's responsibility and the parameters of regulation. If this wasn't confusing enough, TOCs are subject to scrutiny by two bodies representing the interests of the passengers: the Central Rail Users Consultative Committee, (CRUCC) and Regional Rail Users Consultative Committees (RUCCs)[62]. These report to the Rail Regulator.

Contractual Agreements.

> If there is a delay of over three minutes, then someone has to explain why.
>
> [Mellitt 1996:433]

Aside from such legal obligations to the regulators for operating a train service, the TOCs are involved in several different types of contract to run their service. In the industry there were 74 separate track access and maintenance agreements in the first phase of privatisation, involving some 17,000 train movements.[63]

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[60] Godward, E, 1998

[61] Many of these issues were transferred to the SRA in 1999. The ORR's principle area of concern now is the activities of Railrack as the monopoly infrastructure provider. See Chapter 6

[62] Later to become the Rail Passengers' Council under the 1999 SRA Act. (See later, Chapter xx)

[63] Mellitt (1997). p 434.

Their chief contract is with Railtrack, the infrastructure provider. These are in the form of track access agreements which give TOCs the right to run trains to an agreed timetable. These represent both the chief costs for TOCs and chief income for Railtrack. Thus about half of their income goes to Railtrack to pay for access to the infrastructure and the stations etc. as Ford reported:

> This complex set of legal documents establish the rights of access, the number of paths allocated, possession policy ride quality, access to stations, and countless other aspects of rail operation.
>
> [Ford 1996:6]

Obversely, it represents 80% of Railtrack's income.[64]. Given the importance of this relationship and the need to avoid potential abuses of monopoly supplier/ buyer, the ORR determines both the detailed arrangements of individual access agreements, and the overall framework are subject to external regulation by the Rail Regulator. The most relevant one here is the expectation of Railtrack initially earning an annual return of 5.1 % pa, rising to 8% by 1998.

Given these various obligations between the parties, it was necessary to construct a method by which these contracts could be operated and blame for any failings attributed. This was instituted in 1994 by the DoT and involved all the major parties including the regulators and advisers such as Coopers & Lybrand and Deloitte Touche. Thus contracts contain a performance regime which provides does so, and also provides incentives to Railtrack to encourage punctuality and reliability. Conversely it provides provision for compensation to TOCs if they are affected by Railtrack's poor performance. As Mellitt commented:

> It provided incentives for the train operator and Railtrack (and the contractor) to reduce disruptions affecting the punctuality and reliability of scheduled train movements.
>
> [Mellitt 1997: 433]

The relationship between Railtrack and the TOCs is one based on a 'benchmark' which represents the agreed or permitted delays for a group of

[64] NAO 1998.

services over a designated period, usually 28 days. If Railtrack reach this they receive no more bonuses etc. If they exceed their target and fewer trains are late, the TOCs pay performance bonuses to Railtrack. Conversely, if more than there is more than the agreed level of delays, then Railtrack are liable to pay compensation. This was further complicated by provision for the performance, or under-performance of the third part of the infrastructure, the relationship between Railtrack and their infrastructure contractors/ maintainers. Thus Railtrack can attribute 20% of their penalties to the relevant contractors. Thus for every £1 penalty Railtrack incurs, they can offload up to 80% on to contractors. The remaining 20% are borne by Railtrack irrespective of who is to blame. (The idea being to make Railtrack encourage its' contractors to improve performance in respect to repairs and renewals.)

How these costs and blame for delays are attributed was outlined in the 1993 Act[65]. Thus if a train is 1-3 minutes late, Railtrack pays the penalty. If delays exceed 3 minutes an attribution process is triggered. This says that TOCs are responsible for incidents under their control, or involving rolling stock. Railtrack is responsible for all other incidents, whether under their direct control or not; including the actions of other TOCs and contractors. There is no upper limit for the financial implications of delays, and varies according to the type and location – rising from £17 per minute if delays occur on Regional railways, to £150 per minute in London and the South East. The figures are based on an estimation of passengers' valuation of reliability and punctuality.

Additionally TOCs have to arrange agreements with other TOCs if they use stations under their control.

This is by no means the extent of the contract situation as far as TOCs were concerned. The next major series of contractual arrangements involve the leasing of the rolling stock from the Rolling Stock Companies, or ROSCOs. Ford (1996) estimated that this accounted for nearly a quarter of an average TOC's costs and usually involves contracts with two of the three ROSCOs. In turn ROSCOs contract out maintenance work on their rolling

[65] Schedule 8.

stock. In fact the only areas where TOC management are totally responsible for are the train and station staff and those at their HQ.

Railtrack and Its' Contractors

> In some ways, it (Railtrack) is little more than a giant procurement agency, a numbered bank account for collecting TOC access fees and awarding huge contracts.
>
> [Railway Magazine February 2001]

If the role of contracts in operating trains is complicated, the picture in the infrastructure is one of almost unbridled fragmentation. At the apex, Railtrack itself is split into seven different zones, based approximately in terms of geography. As mentioned already, Railtrack's primary responsibility is the maintenance and improvement of the track. However, the actual work is contracted out to private companies. As Rail Magazine reported:

> Of the 11,200 staff, only a thousand or so are engaged in engineering and almost all of them are office bound.[66]

The main contract relationships involve Railtrack dealing with 7 private companies: GTRM; Balfour Beatty; Jarvis; AMEY; AMEC; SercoRail. These represent the top of the contractor pyramid, and they in turn sub-contract out. Sub-contractors then sub–contract etc down the chain. Wheeler (2000)[67] estimated that there were 2,000 companies involving 120,000 contractors, sub contractors and employees. The RMT looking at track side workers stated that 84,000 people held a statutory certificate.[68] But not all of these are permanently employed and estimates of these vary between only 15,000 –

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[66] Railway Magazine. February, 2001. p46.

[67] Public Seminar, No 4, 'Employees' Perspectives.' Cullen Inquiry.20/10/00

[68] Evidence by Jimmy Knapp, Secretary of RMT, to Sub-committee's inquiry into *Rail Investment*. HC (1999-2000), in HC 671-iii qq.356, 357). The gap between the two estimates may also be a symptom that not all track workers have the required certificate. (Anon). Ibid.

19,000.[69] The rest is casual labour. This will be discussed in greater detail in Chapter 7, with the implications for safety explored.

Rail Privatisation: A summing up

The period following 1979 saw a sea change in the attitudes to the public provision of services, both in terms of administrating state functions and providing goods. Ideologically, successive conservative governments believed market forces to be inherently superior to a public sector bureaucratic model. Therefore and where ever possible public sector activities were privatised to various degrees. The conservative philosophy characterised policy towards all areas of the then public sector – both for organisations involved in industrial production, such as British Steel and in the non- industrialised sector of the civil service in Whitehall. Both were subject to the introduction of managerial principles and accountability. To that extent provision of public goods became de- politicised with the proliferation of non- governmental agencies and bodies now responsible for what were once considered politically driven services.

The privatisation of British Rail was part of this process; being graduated over a period of nearly 20 years. During that time it was subject to a number of initiatives, both in terms of re-defining its' functions and how it should be organised to deliver them. Internally, there was a managerial revolution designed to place its' business functions in primary position over the engineering ethos.

The logical conclusion of these developments was the privatisation of the system that began in earnest with the publication of the White Paper, 'New Opportunities for the Railways' in 1992. The central message from this was the intention to promote competition within the new structures and the alternative proposals of privatisation were judged on against this criterion.[70] This was to avoid the possibility that the industry could evolve into a private monopoly. This meant amongst other things the rejection of the Prime Minister's own preferred method of recreating the pre-nationalisation system

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[69] Ibid.

[70] Several references are made to this in primary and secondary literature. For instance, Harris & Godward, 1997; Beesley 1997; BBC 1999.

of 4 vertically integrated companies, based on the geographical regions.[71] Instead private companies would provide services regulated by a mixture of public officials and the power of contract accountability. This would ensure the competitive element that would deliver efficiency. In this commercial world, the provision of safety was not to be immune and managerial principles and practices were to supersede the old railway culture. How this happened and the consequences is the subject of the next chapter.

[71] Sheldon, p.365.

Chapter 4: Risk Management in the Privatised Railway system: the Scientific Perspective

> Safety in the UK rail system emerges as an output from complex changes in technical infrastructure, operating procedures and management styles, impacted upon by shifts in funding and regulatory regime, and by the powerful influence of tragic and newsworthy disasters. Risk management is carried out by means of a pragmatic combination of safety management systems and cost-benefit trade off calculations. Whether this will prove effective in coping with the challenges of the next few years remains to be seen.
>
> [Horlick- Jones 1996: 153-154]

> it is a fact of history that major improvements in the technology of railway safety are often linked with some serious accident.
>
> [Bonavia 1985: 65]

> Whatever economic system is applied to the railways, the funding available will have limits and managers will need to analyse priorities even in terms of safety measures.
>
> [Uff 2000:176]

> I cannot stress too much that QRA is only a tool and that its results are only approximate...It does not and cannot provide answers. It is not a substitute for experienced judgement.
>
> [Appleton 1992: 8]

If Chapter 3 concentrated upon the privatisation process in the commercial operation of the railways, the following Chapters, 4 -7 will outline the consequences for the way safety was managed. Specifically, in Chapters 4 and 5 discussion will revolve around the adoption and use of risk management techniques. Chapter 6 will concentrate on the effects of privatisation had on how the responsibility for the delivery of safety was distributed among myriad organisation. Finally, Chapter 7 will discuss the effects of the contract culture on the provision of safety.

This chapter will concentrate upon analysing the background to the use of risk management techniques in the rail industry and a number of themes and issues surrounding risk assessment will be illustrated. These will include the importance of collating and disseminating accident data in informing risk assessment, and how the privatisation process has compromised this.

Because of its unique and pivotal role in the industry, discussion will centre around an analysis of Railtrack's risk assessment procedures and how they were applied to one of the most controversial risk management decisions of the 1990s: the decision not to install Automatic Train Protection, (ATP). However before this there will be a brief discussion as to how safety was delivered before 1989.

Safety on the Railways 1945-1989[72]

Between 1945 -1989 safety occupied a comparatively low position in British Railways' priorities and very few innovations were introduced that were prompted by safety issues alone. British Rail in the immediate post war situation BR was still run on military lines and structures, with little if any notion of budgets for individual sectors including safety provision. On the contrary, safety in this period was essentially reactive, with accidents being followed by investigations, and any subsequent recommendations being implemented automatically. If it was found that rules and regulations needed to be amended, then the rulebook was added to. This led to a situation where the rulebook became 'unwieldy and physically impossible to hold!'[73] The responsibility for such implementations was left to the engineering department and management was only involved when very expensive innovations were required. [74] (A notable example of this was the decision to extend the

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[72] This discussion is based on the author's interview with David Maidment, head of BR Safety Directorate, 1989-1994; Railtrack head 1994-1996.

[73] Again Maidment 21/10/99

[74] Such that Bonavia commented that part of the Engineer's position and independence derived from this exclusivity, see Chapter 4.

Automatic Warning System, (AWS), to the whole network in the 1950s after the Harrow Train Disaster of 1952.[75])

This militaristic approach began to change with the appointment of [first name], later Lord Beeching, who shifted the emphasis from production based on the military culture to one where there was a notion of financial direction and accountability. This was followed in the 1980s by a managerial and marketing revolution; one which downgraded the importance of engineers, and placed them in a defensive position vis a vis the marketing side, (see Chapter 3). As safety had always been seen as primarily the responsibility of the engineering and production departments, the consequence was that safety issues were sidelined and there wasn't any significant progress in it in that period. As Hall commented:

> Business managers failed to listen to experienced operators... which resulted in several unsafe track remodelling and resignalling schemes. There was a lack of firm purpose and direction in the planning of safety improvements.
>
> [Hall 1999: 9]

In fact any advances came as a side effect of technical innovations designed to improve services. For example, new signalling systems and the improvement of the infrastructure, which indirectly reduced the number of derailments.

As Maidment commented:

> Safety wasn't going forward, it was trying to maintain its ground. Safety didn't need an especially extra effort. This was because accidents were falling.
>
> [Maidment 1999]

Rail Safety: 1989-1996: the Introduction of Risk Management

> The core agenda for safety assessment in technological systems has been framed by the response of the engineering community to the question of acceptable risk: a response that has focused up on the development of formal quantitative methods for ex ante appraisal of reliability, such as probabilistic risk assessment.
>
> [Pidgeon 1988: 356]

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[75] A notable crash that involved three passenger trains colliding at Willesden Junction and costing 118 deaths.

By the late 1980s the passive, reactive culture on safety began to change. This was stimulated by the occurrence of some high profile accidents/ disasters including the Herald of Free Enterprise and the realisation that BR could be subject to prosecution the same way P&O were if a disaster was to happen.

In the wake of this and the disaster at Kings Cross underground station in London, and the subsequent report by Stephen Fennell QC., in 1987, the then British Rail chairman, Sir Robert Reid instituted a separate safety section, or Safety Directorate within BR to co-ordinate safety in a macro sense. [76] Previously, safety had been handled on a divisional basis, with no co-ordination; something which led in turn to a fragmented view of what safety meant and constituted. As Maidment stated:

> There was no clear definition of what British Rail meant by safety. Too few managers were aware of their safety performance....different aspects of safety were managed in different pockets of the organisation.
>
> [Maidment 1995: 3]

A few weeks after its establishment, a major train crash occurred just outside Clapham Junction station in south London (see Appendix 3). This led to a reappraisal of BR's practice to see if the Total Quality Management (TQM), approach that had been applied to the issues of punctuality and reliability could be used for assessing safety provision. It also led management to look for examples of how safety issues were dealt with and risk managed outside the rail industry, in for example the Nuclear and Oil industries and their use of QRA techniques including the ALARP principle.

At the same time, the government backtracked on its initial assertion, made in the light of the Hidden Inquiry into the Clapham Train crash, that money would not be a consideration where safety issues were involved. [77] In

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[76] Although Hall (1999) is somewhat dismissive of its necessity, commenting: "BR created a Safety Directorate mainly because they thought it ought to...It was fashionable." P 9.

[77] Cecil Parkinson. "Financial considerations shall not stand in the way of safety projects." Hansard, 1989. Also Henderson 'How BR fixed the price of a loss of a life' *Times* Newspaper. 08/10/99.

fact the Treasury said that *some* money was available and ring fenced as long as expenditure could be justified. These events led BR's senior management to order risk assessment exercises to identify and rank the risks associated with running the rail network, with a view to adopting risk management techniques such as risk assessment and evaluation. Thus David Maidment and Tony Taig[78] started to adopt a risk assessment of the accidents of the previous 20 years.

Because of the recent high profile disasters, initial attention was focused on rail crashes involving multiple loss of life. However because such low frequency/ high impact incidents yielded poor data, the only solution was to look at precursors to such accidents including Signals Passed at Danger, or SPADS, Broken rails and the reliability of signals. These were then assessed against the recommendations of the Hidden inquiry into the Clapham disaster.[79] In contrast, data for high frequency/low impact events such as accidents involving individual deaths and injuries was more plentiful and accessible.

As a result of their work it emerged that the perception that the majority of rail deaths were caused by low frequency/ high impact events was wrong. In fact the highest death rate was amongst their own staff with a 1 in 1,650 death ratio for contractors, working on the railways. This figure compared unfavourably with almost any other activity, except for fishermen.

But the survey only identified the areas of concern. In order to translate this into a pro-active risk management policy, there needed to be a framework within which any safety proposals could be assessed. To do this it was decided to adopt the framework of the philosophy of 'tolerability' and 'acceptability' as enunciated in the 1988 HSE report, 'Tolerability of risk from Nuclear Stations', (see Chapter 2). This advocated a risk based safety management system, based on the frequency/impact, or FN methodology, using the ALARP principle in decision making, (see Chapter 2 and below.)

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[78] Of the Atomic Energy Agency, later AEA Technology.

[79] David Maidment evidence to Southall inquiry 5/11/99. Author's Interview with Tony Taig, 2000

The new system was much more pro-active than previously, with the identification and measurement of risks on the railway being expressed in terms of employee risk; risk to individual passengers and societal risk arising from catastrophes. [80] This involved adopting the HSE's suggested parameters on tolerabilty set at the upper limits of 1 in 1,000, for employees and 1 in 10,000 for passengers, and the lower limit of 1 in 1,000,000.[81]

These criteria were then assessed and compared against existing prescriptive legislation and recommendations arising from accident inquiries such as ones arising out of the Clapham crash. The objective being to establish a risk based strategy which would identify "critical hazards", and prioritise, or rank measures and projects to control/reduce associated risk, based on a cost-benefit approach.

Coincidentally, to these moves, the Appleton report into risk assessment on the London Underground was published. This criticised the LUL management for devoting too many resources to fire prevention and recommending that the management change its approach to safety to one based on prioritising safety measures on the basis of Quantitative Risk Assessment, incorporating the ALARP principle. As he stated:

> LUL should use the output from its recently completed Quantified Risk Assessment to assist its judgement... the potential risks from, and the delays and their costs caused by, reacting to reports of fire are unnecessarily high.
>
> [Appleton 1992: 31]

However, identifying probability of an event was only half of the equation for making risk management based decisions on risk and there needed to be an evaluation of the consequences of an accident occurring, (see below and Chapter 2). This necessarily involved coming to some notion of an evaluation of human life to inform safety decisions. [Marshall 1993: 24].

BR's valuation of life figure was arrived at on the basis of pragmatism and rates of return. Thus the costing was initially based on the Department of

[80] See also Ball, '*Societal Risk*', see Chapter 2.

[81] Ibid

Transport's valuation for the cost of a fatality/injury on the roads, at £715,000. This was then trebled to take account of factors such as involuntary risk taking and the perceptions associated with multiple death accidents/ disasters, (see below).

The resulting evaluation concluded that the cost of human life to be used would be a maximum of £2m. Thus, no safety project that would cost over £2m per life saved was justifiable; when compared to competing schemes. Between £1-2m per live saved, a sliding scale operated where cost benefit analysis studies would determine which projects were prioritised. However, any safety project that cost under £1m would be accepted without scrutiny. At this figure Taig and Maidment concluded that 92% of the potential benefits could be covered by only 45% of the safety budget and that between £2m-10m, the benefits of extra expenditure were negligible. This was then applied to 240 projects.[82]

Risk Management and the Privatised Industry section

The principles and procedures developed under British Rail continued when the industry was first part privatised between 1993-1996, and afterwards. The major change being that now safety was to be managed not by one organisation, but by relationships between several bodies and institutions. As stated this will be discussed primarily in Chapter 6. For the moment it will be sufficient to note that the main player in ensuring safety in the industry has been and continues to be Railtrack. This was decided as not only are they the biggest single presence in the industry, but because of their responsibilities as the infrastructure owner and provider. Under the 1974 Health and Safety at Work Act (HSAWA), all operators are charged to ensure arrangements to ensure the safe operation of their activities. However because other companies such as TOCs, operate on the infrastructure, Railtrack effectively imports risk on to their system. As such they are obliged to satisfy themselves that these operators run their services safety.

[82] Maidment [1995a;b; 1999]

As Rod Muttrum explained:

> Effectively under the 1974 (HSAW) Act it is the premises' controller that is responsible for the premises of the railway and risk imported to it by other undertakings operating in its' premises.
>
> [Muttum 2000]83

The 'premises' in this case being the track, signals, railway stations etc.

Railtrack does this by proposing examining Railway Group Standards and by validating TOCs' and Contractor's safety cases. Within the Railtrack Group of companies, this was dealt with up to 2000 by the Safety and Standards Directorate, (S&SD) and since then by Railtrack Safety.[84]

S&SD/ Railway Safety, and Safety

The S&SD and latterly 'Railtrack Safety' are responsible for two major components of safety delivery: the establishment and promulgation of Railway Group safety standards and to validate the Railway Safety Cases submitted by 'Rail line' Raitrack's operational arm, the Train Operating Companies, (TOCs), and major contractors.

Railway Group Standards are technical and operational standards that are mandatory to all train operators and infrastructure companies that have had their safety cases approved and thereby belong to the Railway Group. This is to ensure overall safety in the system and the safe inter-working on the Railtrack network. To this end, Railway Safety publishes an annual Railway Group Safety Plan which sets out priorities and targets for risk reduction, for passengers, staff, contractors and the general public. Individual train operators and the operating part of Railtrack also have annual Safety Plans setting out how they propose to contribute to the attainment of the wider Group goals, and also covering such matters as safety and security in depots, car parks etc.

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[83] Evidence to Part 2 of the Cullen inquiry, 2/11/00.

[84] As with the change from British Rail Safety Directorate to the S&SD, the change between S&SD and Railtrack Safety have been little more than cosmetic, with the same structures and personnel.

The onus for devising and developing standards rests primarily with Railway Safety, who both propose and negotiate their introduction.

In this their approach isn't prescriptive or absolute but one which balances safety with cost effectiveness. As Stevenson commented in 1995:[85]

> The railway group standards group is committed to contributing to a safe, efficient, *cost effective* rail transport system and provides.. standards appropriate for this purpose.
>
> [Stevenson 1995: 261][86]

An approach reaffirmed by Professor Uff in his conclusions to the Southall train crash. Thus:

> Railtrack, through S &SD are limited in the introduction of new Group Standards to matters where safety benefits is shown to exceed the costs.
>
> [Uff 2000:176]

In 2001, the then Chief Executive of Railway Safety, Rod Muttram reiterated this cost benefit approach to the establishment of core standards:

> Where possible Railway Group standards are goal setting and......must not prevent the opportunity for new techniques to be developed.
>
> [Muttram 2001: 45]

Thus they are expressed in terms of what needs to be done in order to achieve safety, rather than being prescriptive. It is also complicated by the hierarchical nature in which they are applied, with the details of *how* they are to be achieved being left to individual train operators and contractors. As Muttram stated to the Southall Inquiry:

> I want train operators to do their own risk assessment and decide what is the lowest risk situation for their customers.....as an independent duty holder they should be assessing their own risks and making sure they have suitable controls in place.
>
> [Muttram 1999]

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[85] Note before Railtrack was privatised. See later.

[86] My emphasis

By doing so it introduces an extra layer of complexity, (see Chapter 6), despite Railtrack's of central role in ensuring that procedures are adequate.

In terms of the Southall accident in particular, this delegation by Railtrack to the TOCs when meeting standards had catastrophic effects. This was because the Railway Group Standard concerned with the procedure to be followed when AWS devices were defective, was downgraded from a Category 'A' procedure, where trains would automatically taken out of service, to a category 'B' procedure where TOCs could allow a train to continue so long as a risk assessment had been undertaken to balance the relative degrees of risk associated with continuing or ceasing a train's operations. (See Appendix 3 and Chapters 7 & 8).

The second main task is to establish Railtrack Line's safety case[87] and to approve and recommend Railway Safety Cases proposed by the Train operating Companies, (TOCs), and contractors. The Safety Case is designed to demonstrate that companies are able and committed to assess and control the risks associated with its activities on the railway. This is done through Rail Safety's Audit and Evaluation department, which is responsible for carrying out audits of operators' as well as ensure that Railtrack Line, Railtrack's operational arm, complies with its own safety case.

The Safety Case

> A documented statement seeking to demonstrate on safety grounds why a particular installation or organisation should be allowed to operate or continue to operate.
>
> [Waring 1998: 457]

Taig in 1993[88] defined the Safety Cases essentially as documents by which the operators of a particular industry, or plant, demonstrates to the regulator that they understand the nature of their operation and the associated

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[87] The operational arm of the Railtrack Group

[17] Taig, T (1993), Speech at Second Conference on Engineering Integrity in Railways. Birmingham, 13/07/93.

risks. This is done by setting a series of objectives that establish what the safety case aims to do and how these objectives will be achieved. The issues covered by safety cases range from a demonstrable identification and assessment of risks to a detailed description of the management structure, or system, constructed to manage health and safety.

The heart of any safety case is the assessment of risk and an evaluation of measures to control it. This involves the establishment of appropriate safety systems management and measures to monitor their effectiveness. This is done in various stages including the setting of safety objectives and principles; the identification of hazards and assessment of measures to control/reduce them, [HSE 2000: schedule 1(4)].

The Safety Case as a concept began to be used in high technology industries in the wake of the Cullen report into the Piper Alpha disaster which found that a major contributory factor to the disaster was poor safety culture and the inadequacy of management systems to provide safety. In his recommendations Cullen outlined what the purposes of a safety case should be. These comprised the need to show that certain objectives had been met including the establishment of an adequate Safety Management System, (SMS) that would ensure that the design and operation of installations were safe. This was done in order to satisfy the appropriate regulatory body, the HSE that all major hazards had been identified and measures and systems had been put in place to control them. As he stated:

> The SMS should set out the safety objectives, the system by which these objectives are to be achieved, the performance standards which are to be met and the means by which adherence to these standards is to be monitored.
>
> [Cullen 1990, paragraph 21.56]

The effect of this was to shift the emphasis in the way risk was to be controlled away from one based on prescriptive requirements on equipment standards, to a more pro-active one. As Taig commented:

> The safety case should ensure that a proactive view of safety is taken and that the proactive and preventative measures taken will always exceed those required by law providing a high level of confidence in safety of the railway.
>
> [Taig 1993: 270]

Specifically, this would involve a formal assessment of the risks associated with operating a plant or installation and comprise an obligation to undertake hazard and operability studies; Quantitative Risk Assessment; (QRA), fault tree analysis; analysis of the role of human factors in accidents and the provision of a safety audit. In this regulatory bodies were not to impose methods of achieving this, but rather companies would be left to devise their own arrangements, subject to approval. Thus in relation to 'goal getting' regulations, whilst the HSE should issue guidance these shouldn't be mandatory and nor should they be prescriptive. As he stated their advice should be offered:

> Without prescribing any particular method as a minimum or as the measure to be taken in default of an alternative.
>
> [Cullen 1990: paragraph 21.67]

Safety Cases and the Rail industry

When the Rail industry was being privatised, the HSE proposed a similar safety case regime, in order to satisfy concerns that privatisation could effect safety as profit making organisations entered the industry with little experience of running safety critical processes. As the Health and Safety Executive chairman, Sir John Cullen, remarked in 1993:

> Companies with little or no previous experience of operating on the railways, and managers with limited experience of railway safety issues, will enter the railway industry.
>
> [Smithers: 1993]

Under their proposals, set out in the 1992 document ' *Ensuring Safety on Britain's Railways'*, each prospective train operator and major contractor was obliged to complete a safety case. As of 2001, there were 68 organisations in the industry required to have one. [89] A detailed outline of what a safety case should consist of is in Appendix xx, but each safety case had to be validated

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[89] Nelson, A, *Modern Railways*, 2001.

by Railtrack and ultimately by the HSE. In turn Railtrack must also complete its' own safety case; again to be approved by the HSE. Because of Railtrack's pivotal position in rail safety, it will be necessary to discuss this in some depth. This is the subject of the next section.

Railtrack's Safety Case[90]

The Railtrack safety case was approved firstly in 1994 and emphasised five main principles, being respectively: policy; organisation; planning; monitoring; and review.

Policy included a description of the organisation's overall corporate culture and attitude to safety. It also established the framework by which objectives can be formulated. Organisation involved detailed description of how roles and responsibilities are allocated and co-ordinated. As they stated:

> Effective organisation is designed to maximise the contribution to groups through the creation of a positive safety culture which secures involvement and participation at all levels.
>
> [Railtrack 1998: 56]

Planning involved the production of safety plans and procedures with relevant targets. Here risk assessment was used to establish priorities and to set objectives designed to reduce hazard. The monitoring element involved testing performance against objectives and to highlight, not only any failure in standards, but also to uncover their causes.

These activities were spread across nineteen separate components of Railtrack's responsibilities, including such issues as Leadership; relations with external contractors; safety critical work and safety performance.

How this was delivered was by use of risk assessment techniques as mandated by the HSE's 'six pack' regulations in 1992 and which were introduced in response to EU Directives concerning the management of health

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[90] Railtrack's Safety Case 1998.

and safety. These regulations were a mixture of regulations for specific situations in the workplace and the *'Management of Health and Safety at Work Regulations',* which dealt with the more general issue of how management ensures its obligations towards employees and the public. Central to these was regulation 3, which required that:

> Every employer shall make a suitable and sufficient risk assessment of the significant risks caused by their undertaking which could affect employees and non-employees.
>
> [HSE1992]

These were again not prescriptive but were presented as an Approved Code of Practice, or ACOP, which provided guidance on what was considered a 'suitable' and 'sufficient' risk assessment, including the identification, assessment, evaluation and control of risks. Thus the principle of 'foreseeability' was introduced and it was no longer sufficient to rely on accident data alone.[91] In assessing risk, Railtrack use a mixture of techniques both qualatitive as well as quantitiative; the most prominent being QRA involving the ALARP principle.

QRA and the Railways

> Most of the risk assessments that we've been able to carry out in the railway industry in the last eight or nine years have relied very much on the vast amount of data which the railway has collected over many years, on incidents and precursors to incidents. The database has been good, so that most of the risk assessment undertaken has been based on historic information.
>
> [Maidment 1999a]

> For QRA to be useful, the QRA methodology must be consistently applied.
>
> [Bounds 1995:6]

As outlined in Chapter 2, risk based decisions involving risk estimation and evaluation typically involve QRA techniques including the quantification of likely risks along with an assessment of the benefits of a proposed activity, or technology. Its proponents point to its usefulness in

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[91] Appleby, 1999,p 5.

identifying priorities of hazards and directing resources in the most cost-effective manner. Rose puts the case for its use on London Underground.

> The use of QRA and associated cost-benefit work, have already saved significant moneys on safety expenditure for London Underground by eliminating unnecessary safety expenditure.
>
> [Rose 1995: 5]

He went further and attributed the restoration of proposed cuts in safety expenditure, to the use of a QRA study that showed the likely effects this would have had on increased deaths on the Underground. Central to Railtrack's use of QRA is the application of the ALARP principle, (see Chapter 2).

ALARP and Railtrack

> "Railtrack accepts and will apply the "ALARP" (As Low As Reasonably Practicable) principle, maintaining the drive to improve safety performance within the "ALARP" range, informed by cost benefit evaluation".
>
> [Railtrack 1993]

> 'not putting profit before safety' is a wonderful sound-bite, but good engineering is about securing acceptable levels of risk at an affordable cost. Committed safety professionals balance the costs and benefits of safety measures – 'no risk' or absolute safety' is unattainable.
>
> [Muttram 1999: 23]

> Railtrack's Safety Case imports reasonable practicality, which must be given effect by creation of new Group standards or amendment or abolition of existing Standards....Railtrack cannot impose safety requirements beyond those which satisfy the test of reasonable practicality and cost benefit.
>
> [Uff-Cullen 2001: para 4.15; 4.17]

The change from British Rail to Railtrack meant little in terms of the methodologies used to assess risk and deliver safety, (see above). The centrality of ALARP in Railtrack's approach to safety is laid out in successive Railway Safety Group plans to which TOCs and major contractors must adhere. The heart of this process is adherence to the ALARP principle as outlined in their accepted safety case. [92]Thus Railtrack's upper and lower levels of acceptability are respectively one in 1,000 for its employees and one in 10,000 for its passengers, and I in 1,000,000 for both passengers and staff. At the upper levels, Railtrack would find any activity unacceptable. At the lower or acceptable level, no action needs to be taken. In between these parameters, the ALARP principle operates, utilising Cost Benefit Analysis (CBA) techniques, based on the British Rail evaluation of human life, of £2m.[93] Railtrack's estimation is in effect the industry's as potential operators have to agree to their valuation before Railtrack will accept their Rail Safety Case as part of the safety cascade (see Chapter 6). Within this "ALARP" region, Railtrack publishes after consultation with other companies in the industry, Railway Group strategic objectives which set "milestones" or "benchmarks" for realistic short term aims. The use of ALARP has continued to hold sway in industry thinking on safety measures. Thus a committee of risk assessment experts assembled by the Cullen Inquiry in 2000 concluded that:

> The ALARP principle is a sound concept for the application in the railway industry. It should provide a powerful motivation for companies to seek continuous improvement.
>
> [Sylvester Evans 2000][94]

Having outlined the chronological development of QRA in the rail industry and established its importance in current industry thinking, it is now necessary to examine the utility of Risk Assessment techniques in the industry.

Risk Assessment and the Railways

> The clear emergence of such a quantified cost benefit approach to rail safety is perhaps unsurprising in an industry so aware of its diminishing subsidy from central government and its need to be seen to be competitive in economic terms.
>
> [Horlick- Jones 1995: 153]

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[92] See Evidence to Select Committee on Rail Safety, 1998-99.

[93] The current valuation (2001) is £3.2m

[94] Evidence to the Cullen Inquiry Part 2.

The concern of rail management in attempting to draw conclusions on...major accident prevention measures in general, is whether the differing circumstances of railway accidents influence passengers in the value they place on life, and then willingness to pay, taking account of the public perception of the risks involved in travel by train....The impact on public opinion of one catastrophe involving multiple loss of life is without doubt greater than a series of accidents in which the same number of people are killed.....Of course, cost per life is only one element in the safety decision making process, which must also take into account a range of economic, commercial and political factors as well as customer and public opinion. Whenever a decision is made on safety spending, there has to be an implicit valuation of life also made.

[Maidment 1994:63]

the HMRI is becoming increasingly concerned at the wholly unjustified faith which many railway managers have in simple numerical risk assessment techniques, which often seem to be used as a substitute for decision making, rather than as an aid to prioritisation of effort....of equal concern are risk assessments which at first seem to be detailed and analytically thorough, but which on further examination, are found by the HMRI to be seriously flawed.

[HMRI 1997: para, 73]

The use of risk assessment techniques in the rail industry has become increasingly controversial in recent years following the rejection of ATP (see below) and the subsequent disasters at Southall and Ladbroke Grove, both of which could have been avoided if ATP technology had been available. The following sections will examine the utility of such techniques, including the use of CBA in informing decisions about safety.

As stated already the use of risk assessment techniques is central to the provision of safety operations in the rail industry and occupies a central position in the HSE's Rail safety Case regulations. As they stated in 1994 about safety cases:

(They) provide a comprehensive working document against which management and also the acceptor and HSE, can check that the accepted risk control measures and safety management systems have been properly put into place and continue to operate.

[HSE 1994: 2]

Such emphasis continued throughout the 1990s with HMRI annual reports on Rail Safety regularly commenting on its utility and their consequent disappointment that TOCs were slow in adopting them.

This concern continued in their latest regulations issued in 2000.

> The risk assessment process should ensure that decisions made about how to manage risks are made in an informed, rational and structured manner.
>
> {HSE 2000:Section 4]

Risk experts at the Cullen Inquiry part 2 reflected this concentration on risk assessment. Thus the inquiry asked eight risk experts to consider the usefulness of using its techniques in the railway industry. This resulting document the *"Joint Statement of Risk Assessment Experts"* concluded that it was 'crucial' element in the provision of safety on the railways, [Sylvester Clarke 6/12/ 2000][95].

Professor Evans' paper on Safety cases (1999) also points its' importance when he states that the section devoted to risk assessment constituted about a fifth of safety case documents. There are a number of theoretical and practical issues to be discussed in relation to the use of risk estimation and risk evaluation in the industry. These centre around two main issues: the availability an reliability of data and the methodology used for making decisions based on it. Within these categories, there are such issues as industry isomorphism; the consistency of approaches to assessment; and communication; the notion of objectivity in risk assessment, including expert to expert disagreement; and the exclusion on non-expert input. These subjects will be discussed in the following sections.

Reliability of Data

> One of the key elements to keeping disasters at bay within any organisation is the existence and availability of necessary information.
>
> [Toft & Reynolds 1997: 84]

The pre-requisite for any risk assessment is the collection and dissemination of data either in terms of reporting incidences and investigation of accidents. Toft & Reynolds, (1997), point to the importance of information in the avoidance of accidents and disasters and that what might seem to be an

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[95] Ibid

isolated incidents nonetheless have the potential to inform practice in organisations and across an industry and beyond. This is because of isomorphism, or similarity of form and composition that can exist between organisations and even between industrial processes in different industries. In this they extend and adapt Von Bertalanffy's systems theory, (see Chapter 2). Such isomorphism can take a number of forms and they identify four: event isomorphism; cross –organisational isomorphism; common mode isomorphism; and self-isomorphism.

All forms of isomorphism have relevance for railways as although it is fragmented into dozens of organisations,[96] the various sectors provide identical services in identical ways. Thus the 25 TOCs run passenger services, the three freight companies move freight, the Rolling Stock Companies provide the locomotives and carriages etc. In doing so, common practices are necessary throughout the industry as dictated by the 'rule book' and common standards which are promulgated and implemented by the Railway Safety Group, (see above).

Event isomorphism involves the occurrence of two separate incidents that whilst manifesting themselves in different circumstances create identical risk situations. Toft cites the rail industry when he analyses the Clapham crash and the incidence of SPADs. It will be shown that this was relevant for the Southall and Ladbroke Grove disasters (see below). Knapp (1998) also endorses the existence of industry isomorphism and the vital role information and its dissemination in promoting safety.

In terms of the Rail industry. these can take the form of both high frequency/ low impact and low frequency/ high impact incidents.

The two main categories being low probability/ high consequence accidents such as a train crash involving multiple fatalities, and high probability/ low consequences accidents involving say, individual injuries or none at all. As the HSE state:

> A range of different approaches to risk assessment will be needed to cover the scope and range of risks involved in a railway operator's activities. Approaches suitable for determining low probability / high consequence risks will not necessarily be appropriate for high probability / low consequence matters.

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[96] Depending on definitions 125 - 2,000 organisations.

[HSE 2000: section 4, 2]

Such differences will have implications for data collection.

Low Probability/ High Consequence

As already stated at the beginning of this Chapter data from accidents causing multiple fatalities is by its nature comparatively rare. As Evans (2000) points out: "accidents of the severity of Ladbroke Grove are thankfully rare."[97] Therefore information and data comes from two main sources: accident inquiries and the recording of phenomena thought to presage such disasters, including signals passed at danger, (SPADs), broken rails and human factors such as driver inattention and inappropriate behaviour. These latter indicators are typically frequent incidence/ low impact phenomenon, but have proved to lead to the multiple fatality disasters.[98]

Accident inquiries

In the railway industry the accident inquiry format can take several forms and can be conducted on several levels. There can be an internal company inquiry/ inquiries; an internal industry inquiry; an external inquiry held by HMRI; a coroner's inquiry, in the event of a fatality/fatalities; and increasingly over the last few years, a public, or judicial inquiry, ordered by the government. Additionally, there is the possibility of an investigation by the British Transport Police, (BTP), with a view to possible criminal prosecutions.

In the event of multiple loss of life, it is probable that all the above would be activated [99]but normally most accidents would involve the first two levels. In assessing the utility of such inquiries for providing information and

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[97]P.10

[98] For example under 1% of SPADs lead to accidents. Davies 2001. P.5.

[99] For example Southall, 1997 and Ladbroke Grove, 1999, although not Hatfield 2000, nor Great Heck, 2001, see Chapter 8 and appendices for details.

how privatisation has affected them, it would be instructive to consider the situation before and after the system was fragmented.

Accident Inquiries under British Rail

As has been mentioned several times before in Chapters 4 and 5, the pre-privatised rail system was in the form of a publicly owned and operated monopoly, British Rail, which organised and operated all aspects of rail travel in the UK. As such the usual form of accident inquiry took the form of a local investigation with issues being resolved at that level. For more serious incidents, such as SPADs, a 'Joint Inquiry' was held where the investigation was more formal, with witnesses/ participants being interviewed and evidence taken down. The results being sent up to BR headquarters possibly with recommendations, which were not binding. These inquiries had two main aims: to find out what happened and to apportion responsibility. As their manual stated:

> Establish the cause of an accident so that, when necessary, action may be taken to avoid a repetition; the allocation of responsibility is also necessary.
>
> [BR 1989: Section 8]

This latter clause hints at the notion of apportioning blame and this is confirmed by Clarke, (1995), and Maidment, (1997). Thus Clarke's survey of inquiry reports led her to conclude that they were "content" to focus on the immediate causes of incidents and apportion blame, usually on the driver. As she stated: "in most Inquiry reports it is evident that the buck clearly stops with the Driver."[100] From inside the industry, Maidment whilst being more circumspect in his phraseology, echoes the view that little was done to look beyond the circumstances and participants until the Clapham rail crash and the subsequent Public inquiry.[101] One consequence of this was that if fault was found with procedures further up the organisation, it was only remarked on in terms of personalities, and not as failures of management systems. In

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[100] Clarke (1995), p. 95

[101] Maidment, 1997, p.69

turn this led to a cautionary approach to pointing out failures as they could potentially be the subject of legal action. As Clarke concluded:

> As these reports are at the disposal of legal representatives for the purposes of claiming compensation, this may account for the reluctance of panels to find fault with British Rail, and thus making BR liable for compensation costs.
>
> [Clarke 1995: 96]

Because of this, the usefulness of such inquiries could be limited. A more pro-active approach was to develop in the 1990s[102], but this was to be offset by the change in the composition of such inquiries as a result of privatisation.

Accident Inquiries in the Private Industry

> As far as major incidents are concerned it is possible that there are five separate investigations going on at the time of a railway accident.
>
> [Leeper 1999]

> The lesson to be learnt from the Southall crash is that accident investigation is not rendered more effective by duplicated and partial procedures. The reverse is the case.
>
> [Uff 2000: 16.27]

> Too many cooks spoil the broth
>
> [English proverb]

> An internal Inquiry conducted by the prisoner in the dock? Potentially. The idea that a police officer goes to the scene of a burglary and invites the alleged burglar to take possession of the scientific evidence is a joke. And yet we go to the scene of something much more serious and are invited to take seriously an inquiry undertaken by potential defendants. I don't think that is in the public interest. Railtrack and the train companies would say it was in the public interest - that's two different things
>
> [Satchwell 1999]

The transition from BR to the privatised industry had implications for both the reporting of incidents and accident investigations, extending the blame culture into safety matters. The blame culture has affected the process of accident investigation in three significant ways. Firstly, it has had implications within individual rail organisations where employees have been less than open on safety issues. Secondly it has shifted attention away from

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[102] Ibid

the prime aim of such inquiries to find immediate and root causes of accidents. Thirdly, it has delayed the dissemination of information in the industry.

This can be seen at all levels of inquiry in the industry, starting with the reporting of incidences to company management.

Internal Company Inquiries

> There seems to be a large base of unsafe acts and non-compliances that have gone unchecked which could alone, or in combination, create an accident. The industry is failing to identify these non-compliances and is therefore not learning from them
>
> [Public Seminar 4]

The blame culture has inhibited internal company inquiries, as employees are reluctant to report incidents where safety has been compromised. Lucas (1995), points to the organisational aspects of collecting and interpreting accident data. She also makes the point that the risk management approach employed in the rail industry, with its emphasis on analysing risk in terms of man – machine interfaces, as opposed to examining socio-technical issues, (see Chapter 2 and 6).

Thus the public seminars held as part of the Cullen Inquiry, part 2,[103] revealed the pressures placed on the workplace in the post privatised industry. This will be discussed at greater length in terms of the effects on safety culture, see Chapter 6. However, in terms of incidents that could inform safety practice, this has taken the form of employees failing to report incidents that could have led to safety being compromised. Specifically it revealed that operational staff as well as middle management felt that when an accident happened, the search will concentrate on who was to blame rather than lessons being learnt and used to prevent such an incident reoccurring. The consequent fear of discipline and/or personal liability stops

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[103] (See Appendix 2)

people from being as open and honest as they otherwise would be.[104] In extreme cases, it may encourage them to cover up their mistakes.[105] As seminar 4 concluded:

> Pre-privatisation there was much greater confidence and a more open and honest approach, as there were no financial penalties. One would get disciplined, but now, given the same issue, one would get sacked. There has been a loss of openness to share and co-operate.

It concluded that Staff were frightened of reporting even slight incidents of a non-serious nature, as they get pulled in by their supervisor, asked to fill out a form and sometimes get disciplined slight incidents of a non-serious nature. Horbury (1996), in her study of one TOC pointed out the lack of trust and almost paranoia on the part of drivers as they are the focus of investigations into accidents. As she reported:

> It appears as though the workforce have a persecution complex, and believe they will be blamed should an incident occur. However, since management attribute accident causes to human error, the workforce's perception would appear to be justified.
>
> [Horbury 1996:252]

This was echoed four years later by one participant of the public seminar when he said 'Staff are afraid of reporting safety issues as they maybe disciplined.'[106] As Dupont concluded:

> The culture that has been allowed to develop is too often one that drives apportionment of blame rather than aligned, supportive problem solving. There is evidence that this inhibits free and open reporting of incidents especially near misses. There is also evidence the investigations that do take place often aim to find the guilty party rather than the act and the reasons behind it.
>
> [Dupont 2000]

The first attempt to quantify under reporting of incidents came in 1994 when Scotrail became concerned about their SPAD record. Although this

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[104] Thus Rosser: "there is a company who has introduced a policy of two strikes and you are out, which is actually going to drive the problem further underground." Evidence to Part 2 Cullen Inquiry, 2000.

[105] Op.Cit. No. 28

[106] Ibid

wasn't exceptionally bad, they commissioned Vosper- Thorneycroft of Portsmouth, UK, to undertake research, into the matter. They looked at various issues such as training, which was felt to be a major cause of SPADs. To undertake this, he talked to the Driver Team manager in Scotrail. Whilst he found that there was no problem with training as such, he did find that there wasn't full disclosure about incidents and their circumstances. This was because of the disciplinary procedures associated with SPADs.[107] Thus each TOC operates a driver at risk register, the operation of which is left to the company's discretion. Discipline is graded on a points system and drivers that accrue. With 10-15 points being the point at which a driver is deemed to 'be at risk' but it is the Driver team leader that decides the scale of concern about incidents, as against the company's criteria. This degree of discretion means that within and across companies there are differences in assessing risk, with interpretations of central group standards. Speaking from inside the industry, Lucas also pointed out that degree to which the severity of incidents is viewed is also variable; being a function of organisational and managerial factors in individual TOCs, (Lucas 1995). This has led to a situation of drivers lying and giving misleading information about near misses.

As Professor Davies of CIRAS commented to the Transport Select Committee in 1998:

> The kind of reports we get from drivers and other safety critical staff tend to be those normally associated with discipline......with drivers telling us things that they did wrong or assumptions they had made or habits that were common in the industry but perhaps management did not know about.
>
> [Davies 1998: q278]

Such problems with communication led to the establishment of a confidential reporting system, CIRAS initially operated by selected TOCs and the University of Strathclyde, under Professor Davies. These enables employees to report safety concerns and breaches that can be relayed by CIRAS to their company. There will be more discussion of this in Chapter 7, but suffice to say here that however successful or appropriate the scheme is

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[107] Author's interview with Linda Wright, CIRAS, May 4th 2000,

its existence has been taken to be an indication of the lack of trust that exists between staff and management. Thus public seminar 4:

> The success of CIRAS is evidence of the lack of trust and confidence, and the fear of apportionment of blame. Many incidents and more importantly, the reasons behind actions that cause these incidents, have been reported through CIRAS and not through the official (company) reporting channels.
>
> [Public Seminar 4 2000]

Another reason for not reporting incidents was found by Horbury in her 1996 work which was concerned with organisational learning, or rather the lack of it in an unidentified TOC. She found that few of those surveyed regarded incidents as not being important enough to report and 'perceived it as an inconvenient duty' to do so. This, she concluded was a result of a combination of lack of response and action by the TOC's senior management when incidents were reported and a desire to protect themselves from possible disciplinary action. The only exception being technical faults that may have implications for other drivers' safety.[108]

The Railway Industry Inquiry, (RII)

> With the multi-company environment, blame has become an operational reality.
>
> [Horbury 1996: 253]

The second level of inquiry is the Internal Accident inquiry. In the privatised industry closely follow the old BR Joint Inquiry procedures, there are some differences and developments. The main exception being that whereas the BR model had an operating departmental head as chairman of inquiries, the privatised inquiry moved in the 1990s to appointing independent chairmen, of sufficient expertise; the panel being appointed by the Railtrack director in whose zone the accident occurred. The second change was the attempt to change the emphasis towards identifying underlying managerial

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[108] Horbury, A, 1996, p.229. She also related this to the blame culture, thus: 'It is hypothesised that this is the case with drivers as they believe they will be blamed for most incidents, and hence protect each other." See also Clarke 1995, with her analysis of differing perceptions of what constitutes a risk between train drivers and middle/senior management.

factors to incidents, and to being more pro-active in their outlook.[109] However the use of the old model has come under increasing strain, with for example completion of such inquiries being typically delayed beyond the 8 week period stipulated in the Railway Group standard. Indeed delay is the norm, with 90%+ failing to meet the deadline.

As Railtrack recognised:

> Whilst these may have been adequate in a single, vertically integrated, state owned company it is increasingly clear that the process is less well adapted to a multi- company industry.
>
> [Railtrack 1999: 3]

One of the reasons for this is the lack of resources and management speciality in terms of investigation, which has also led to an inconsistency in their quality and hence their overall effectiveness. Here Railtrack Line[110] has been criticised for not having a consistent approach and standard to investigations throughout its seven zones, with the emphasis being on outcomes of accidents rather than potential severity[111]. As the HMRI state:

> If inadequate attention is given to events which could have had serious consequences the chances of capturing important data about failures in the system will be lost.
>
> [HMRI 2000: 45][112]

However there has also been development of a more explicitly adversarial and confrontational approach, between the participants. As Davies remarked:

> I do not think that with 53 different companies in the (Railway) group, and then a large number of other companies who work on the railways...the commercial pressures lead to the building of barriers between companies....where safety is concerned those barriers are not at all appropriate.

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[109] See Maidment, 1997; Railtrack, 1999.

[110] The operational arm of the Railtrack Group.

[111] Railtrack Line operates on zonal system based on geographical lines and following the areas run by the pre-war 'Big 4' companies. Within each zone the investigation of accidents is the responsibility of individual zone managers.

[112] Their emphasis.

[Davies 2000]

This was remarked up on in several interviews undertaken by the author, with several interviewees pointing to for example the change in the composition of inquiry boards from engineers in the days of British Rail to lawyers representing the parties involved in an accident.[113] This has led to the development of a blame culture that has hampered the inquiry's role of finding causation and transmitting information and recommendations. This reflects back on Smith (2000) and his analysis of organisational barriers to learning. According to Clarke, (1995), the tendency to find blame rather than establishing causation isn't exactly a new phenomenon[114], but it has been exacerbated in a privatised industry characterised by fragmentation and the proliferation of interested parties. [115] As Rix pointed out:

> Since the days of fragmentation took place within the industry, it has often been quite common to see within the industry Inquiries a protectionist role being played out by the interested parties because of the cost implications. It is a very expensive business.
>
> [Rix 2000]

This arises mostly due to the way organisations are related to each other by a series of contracts based on performance and associated penalties, which has led the need to attribute blame elsewhere. As one participant of a public seminar on rail safety put it: "A delayed minute is a £ sign", [Anon].[116] Another made a similar point:

> financial pressures has led to a desire to shift the blame for delays. So you have to remove the element of blame out of contractual relationships that aren't conductive to safety.
>
> [Public Seminar 4, Anon]

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[113] For instance, Anthony Smith, CRUCC; Tom Custance, AMEY representative.

[114] Thus one participant at Public Seminar, 4; Employees' perspectives, Cullen Report, 18th October, 2000 "there has been 150 years of blame in the rail industry." The author knows the source but under the constraints imposed by the Cullen Inquiry, any quotes from these seminars are bound by confidentiality."

[115] Ibid.

[116] Op.Cit 30.

Such confrontation has had knock on effects on the willingness to co – operate on industry wide issues, such as safety. As Muttram stated:

> The complex and contractual relationships in the industry, the conditions of the regulated track access contracts, plus an increasing tendency for action through the courts, is making the release of accident causation and remedial actions very difficult.
>
> [Muttram 2000:136]

The Uff inquiry investigated the internal inquiry system and specifically the one concerned with the disaster at Southall, (see Appendix 3). As with all others, this was composed of an independent chairman and representatives of the main organisations involved. Indeed it is part of contractual arrangements between operators and Railtrack that if an incident/accident occurs, operators are obliged to investigate causes.[117] Thus Alison Forster for Great Western Trains, (GWT)[118]; Les Wilkinson for Railtrack and Tom Birch for EWS. The remit was to identify the immediate causes of the accident; any underlying causes and any actions that could be implemented in the short term. Uff considering its effectiveness concluded that it had conduced itself 'conscientiously and reasonably'. This didn't stop him from making adverse comment on the principle of organisations involved in accidents investigating themselves thus:

> It is impossible to conclude that the interests of one or more of the Panel members did not influence the coverage of the Inquiry or the conclusions reached.
>
> [Uff 2000: p.121, para 9.33]

Accordingly he recommended that in future such panels should be made up neutral experts. [119]

Lord Cullen formally addressed the issue in part 2 of his inquiry into the Ladbroke Grove disaster. Here attention was focused on the trade off

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[117] See for example the evidence to the Southall Inquiry of Paul Nicholas, assistant Chief of BTP, 25/10/99.

[118] Who became the ATOC representative on safety issues.

[119] Uff Report, Recommendation 78.

between the expertise of people familiar with operating the system and the conflict of interest. As Forster said:

> I really think that it (RII), doesn't work very well at all......certainly in cases of serious incidents....it is unreasonable to be investigating yourself and your organisation.

Such composition of boards led inevitably to the second effect of the blame culture: the concentration on finding where the blame for a particular accident lay, rather than finding root causes. Thus Forster again speaking for ATOC:

> I think it (RII) has largely been ineffective at determining root causes. I think it has looked at primary sources largely. The determination of root cause has been very poor in the industry.
>
> [Forster 2000]

This view was supported by a report by Dupont into accident investigations undertaken by Connex TOC which concluded that:

> Accident investigations are geared to find the person to blame and not the unsafe act. The investigations are very superficial and hardly ever is an effort made to discover the root causes, the removal of which is the only guarantee of preventing recurrence of the same or a similar incident.
>
> [Dupont 2000]120

From Railtrack came a similar conclusion on the implications of a blame culture:

> it is widely accepted that an investigation into responsibility for an accident will produce evasive behaviour on the part of those who believe that they might be found at fault. Clearly this may deprive the investigation of important evidence and could impact on its ability to fully establish both the immediate and underlying causes.
>
> [Railtrack 1999: 6]

The realisation that confrontation was having such adverse effects was such that in the immediate wake of the Ladbroke Grove crash, the industry of its own violation promptly abandoned the appointment of interested parties on internal inquiries, thereby pre-empting the Uff recommendation by nearly a

[120] Cited in Evidence to Pert 2 of Cullen Inquiry.

year.[121] However, the HMRI report into how safety is managed by Railtrack, 2000 still found that:

> An examination of some investigation reports indicated that the root underlying causes were not always being assiduously pursued.
>
> [HMRI 2000: 45]

in turn this affects the quality of the database on accidents that Railtrack maintains. Thus whilst the HMRI praised the efficiency of the collating systems the absence of data about accident causation:

> weakens the potential of the system to reveal patterns of underlying causation which could be a powerful guide to prioritising and directing future effort.
>
> [HMRI 2000: 46]

The third major effect of the blame culture has been to delay and hamper the dissemination of information arising from the inquiries. Thus Muttram made the difficulties plain when he revealed that because of the blame culture, reports of incidents from individual TOCs were not routinely communicated to other organisations in the industry, thus:

> I have recently written to all members of the Railway Group seeking their agreement to the publication of summary reports of significant incidents on a regular basis. It remains to be seen what their response will be.
>
> [Muttram 2000: 136]

In this he was echoing Railway Safety's 2000/2001 Rail Safety plan which lamented that when it came to sharing information on any safety related issue such as reporting of SPADs there was still a lot to do. [122] According to Lucas (1995), the lack of communication also arose out of the way individual TOCs have different perceptions of what constituted an incident. As she stated: 'Different safety cultures will have an impact on which accidents are investigated.'[123]

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[121] Custance, T interview with the author, 2000. Forster, 2000.

[122] As it stated: "although much has been done to date, it is apparent that there is still room for further significant improvement." P.11

[123] p.132.

It should be noted that at the time of writing the industry had been part privatised for 7 years and fully privatised for nearly 5 years.

Aside from non co-operation, Forster's evidence also pointed to an extra complication in that it's inevitable that Railtrack, as the infrastructure provider, will sit on RIIs no matter what the accident is, leading to the perpetuation of conflicted interest. Further, after the RII, the report is sent to Railtrack's own Safety Review Group in the zone where the accident happened for review.[124] If Railtrack dispute or reject any conclusions, there is no mechanism for overcoming the deadlock and hence recommending any actions.

As she commented:

> The industry has developed a very bureaucratic investigation process, to the extent that it's taking up to two years to get some fairly routine recommendations and inquiry reports out to the industry.

The blame culture has permeated internal industry inquiries, but the industry is also subject to being investigated by external agencies: the safety regulator, in the form of the HMRI; the possibility of the HSE/ DETR[125] ordering a judicial public inquiry; and the possible involvement of the British Transport Police, (BTP).

HMRI and accident Investigation

The HMRI are empowered to investigate accidents and incidents under the provision of the 1974 HSAWA. The majority of investigations where Inspectors are involved are held in private and involve him/her acting alone to collect and assess evidence. There are typically 10-12 of this type a year. [126] For the major disasters, involving multiple loss of life which the HMRI judge to be of significant concern to the public, such as Southall and Ladbroke Grove, the HSE commission Public inquiries. This is the subject of the next section,

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[124] In the case of Southall and Ladbroke Grove, Railtrack's Western zone.

[125] Department of Environment, Transport and the Regions.

[126] Wells, p71

but neither inquiry is without its problems. The principle problem is that of resources.

The HMRI is charged with a number of functions, but they have always been a relatively small organisation and under- resourced. In 2000 their staff was a total of 125, with only 70 Inspectors in the field.[127] Coleman in his evidence pointed to the difficulties of recruiting experts into the HMRI. As he put it to the Part 1 of the Ladbroke Grove Inquiry:

> Problems with filling vacancies within HMRI have become significant during the last two to three years, mainly affecting the Technical division and the filling of posts with staff with technical knowledge and experience of the railway industry. 1st April 1999 figures represent a shortfall of 24 staff, including a shortfall of inspectors because of difficulties in recruitment."
>
> [Coleman 2000: 8]

Part of the problem arises because the HMRI cannot compete with salaries offered in the private sector. [128]Such shortages have led to a situation where the HMRI have seconded staff from Railtrack on a regular basis - the main organisation they are supposed to regulate.[129]

Such lack of resources has given rise to a situation where Inspectors in the field are often handling literally dozens of incidents simultaneously, assessing whether they warrant investigation etc. This has led to a situation where some Inspectors work 30% overtime. [130] More importantly though is

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[127] Coleman, Modern Railways, November 2000.

[128] A figure of 20% differential has been mentioned. Public Seminar, No 2, October, 2000. Another complication is that as part of the HSE, the HMRI must adhere to general agreements on pay scales and structures for the Civil Service, as negotiated with the Civil Service Salary Review Board and Public Sector unions etc.,

[129] Indeed Coleman makes a virtue of this, in his evidence to the Part 1 Ladbroke Grove Inquiry. July 14th 2000. Stating his belief that it: “in fact this is a very desirable piece of transfer for the benefit of the individual concerned so as to be able to work on both sides of the fence.”

[130] For example the field inspector supervising Railtrack over work on Signal SN109, the signal that was to prove instrumental in the Ladbroke Grove crash handled 45 accident cases in 10 months in 1996-1997. Cullen Inquiry, Part 1.

that it has led the HMRI to ration their investigations. Coleman (1999) outlines the criteria for HMRI investigations as being a balancing act between perceived seriousness of the incident and the costs associated with investigations. As said:

> resources devoted to investigations must be properly targeted and used "proportionately" arrangements.
>
> [Coleman 1999: 6]

This leads them to balance the actual severity of an incident against more practical issues such as the likelihood of achieving results in the form of, for example, successful enforcement orders. This gives rise to another problem whereby decisions on whether to investigate concentrate on the actual consequences of the accident and their severity are considered, and not the potential severity. (The same criticism they make about Railtrack Line investigations.)[131] On this basis, they 'aspire'[132] to investigate 3% of accidents on the railway; leaving the bulk of inquiries to the formal, or internal, industry inquiry – the successor of the BR 'Joint Inquiry'. However it is still the case that for some 97%+ of rail related accidents, the industry is left to investigate itself. Now by far the majority of these will be trivial incidents, but in terms of communicating information that risk assessments are based on the RIIs are the only sources, (see above.) It also has the effect of placing the HMRI in the subordinate role of relying on company/industry reports and information when assessing whether an incident however apparently trivial is nonetheless one that requires the HMRI to act, or investigate matters further.[133]

This also applies to what they call major investigations, such as accidents involving multiple fatalities such as Southall and Ladbroke Grove. External funding is available for such investigations, but again because of the acute financial constraints on HMRI, the technical investigations of any

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[131] See above

[132] Ibid

[133] Evidence by David Eves to Part 2, Inquiry, 14th November 2000.

accident will to a large extent, still be farmed out to private sector organisations. As Coleman remarked:

> We do not carry the sort of numbers possible who are necessary for doing the kind of work which we called on them to do.
>
> [Coleman 2000c]

Again this inevitably means using experts employed or contracted to Railtrack and the rail companies. [134]

However major disaster Inquiries have highlighted a second concern about the HMRI's role in accident investigation: the effectiveness and appropriateness of the HMRI investigating such accidents at all.

Specifically the charge is that there is potential conflict between the dual roles of HMRI as investigator into accidents and its function as safety regulator, with overall responsibility for safety on the railway[135]. In the case of Ladbroke Grove this led the HMRI investigating its own actions in the run up to an accident. Specifically, how Rail Inspectors allowed signals including SN109 to be left in service over a 5 year period, even though the work done in that area had not been approved by HMRI as being fit or adequate.[136] The other type of inquiry the HSE/HMRI can order is the Public Inquiry which are usually reserved for disasters.

Public inquiries

> Experience of Tribunals of inquiry has revealed the dangers to which a procedure of this kind is naturally prone. The Inquiry is inquistorial in character, and usually takes place in a blaze of publicity. Very damaging allegations are made against persons who may have little opportunity to defend themselves and against whom no legal charge is preferred.
>
> [Wade and Forsyth]

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[134] As one participant to Seminar, 2 remarked: "The experts that don't work for Railtrack don't exist"

[135] For further details on this see Chapter 7.

[136] These issues will be discussed at greater length in Chapter 7.

> there is no substitute for public exposure of the scandal, the national disaster or the abusive behaviour.
>
> [Blom-Cooper]

> We got to the truth and that was important... the process was more confrontational than I had expected. I think we were over run by the lawyers.
>
> [George 1999]

> The plain fact is that we have never succeeded in finding the perfect form of inquiry.
>
> [Edward Heath][137]

In Administrative Law, the term 'Public Inquiry' has a very broad meaning and a number of typologies have emerged over the years, designed in principle at least to fulfil a number of specific functions. Thus some may be intended to establish the facts about a particular event or series of events; leaving government ministers or agencies such as the HSE, to interpret them and/or make recommendations based on the facts. Others such as the Hidden; Fennel; Uff and Cullen reports into rail disasters have all been charged with finding the causes and coming up with recommendations. [138] These are the subjects of this section. Thus the public inquiry into Southall crash was announced by the HSE on the 20th September 1997 was charged with determining:

> Why the accident happened, and in particular to ascertain the cause or causes, to identify any lessons which have relevance for those with responsibilities for securing railway safety and to make recommendations.
>
> [Uff 2000: 91, para 8.1]

Former railway Inspector, Stanley Hall characterises the use of "Public Inquiries" in the industry as being divided before and after the Clapham train crash.[139] Before Clapham the only form of public inquiry was the technical investigation undertaken by a Railway Inspector, much in the way they do at

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[137] HC Deb vol 27 c494, 8/07/82

[138] Clapham 1988; Kings Cross 1987; Southall, 1997 and Ladbroke Grove 1999 respectively

[139] For details of the crash see Appendix xxx.

present, (see above). The major difference was that these were conducted in public whereas they are now held in private.

The Clapham Inquiry saw the introduction of the judicial inquiry for the first time and there have been two more held in the privatised era. The source of the holding of Public Inquiries into rail disasters is the 1974 HASWA, where it is up to either the HSE and/or the Secretary of State for the environment to order. [140]

Public inquiries have been criticised on a number of grounds. Firstly, there is the criticism that Public Inquiries are often established for several reasons, some of which are potentially contradictory. Borodzicz (1995) points out that they can be called upon to find out what has happened in a particular disaster including the sequence of events; the primary causes and the underlying causes. These feeding into recommendations that should be practical and politically feasible. At the same time there is the desire to provide the victims and bereaved with a platform for communicating their concerns, as well as assuaging the wider public's concerns.[141]

This view was confirmed by another lawyer involved, Louise Christian who represented the victims and bereaved at the Southall and Ladbroke Grove Inquiries. She outlined the main functions of a public inquiry as being respectively to: Establish the facts as to what happened*; ensure Public accountability to those to blame;* and to produce recommendations to address the failures identified in the inquiry.[142] In this, Christian pointed out that there was a danger of the aims being contradictory, and in the case of Ladbroke

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[140] Under the Health and Safety (Procedure) Regulations 1975, SI 1976 No 1246.

[141] As Christian observed about the bereaved at the Southall Inquiry: "It's been very cathartic and important for them to know what happened. Anger can be a very constructive emotion" Interview, 20.07.00. At both Southall and Ladbroke Grove significant time was given over to allowing victims to testify to their experiences and how they were affected.

[142] Interview with author, 20/07/ 2000. My emphasis.

Grove, the rail companies had been trying to lay the blame at each other's door.

All these elements were evident at both the Southall and Ladbroke Grove inquiries.

. *Secondly they have been criticised for being lengthy and slow, often* stretching for several months. In the rail industry, Hall has compared the present situation unfavourably with the old system in terms of the duration and the consequent delay in disseminating the results to the industry, as well being distorted by their quasi legal nature, arising out of the blame culture. Thus such inquiries have lasted a great deal longer than the 1-2 days when the Rail Inspectorate was in sole charge.[143] The Clapham Inquiry lasted 65 days and involved consideration of 13000+ documents.[144] The Southall Inquiry took 32 days of testimony spread over 12 weeks, involving the examination of 200 witnesses and 30,000 core documents.[145] The inquiries arising out of the Ladbroke Grove lasted 12 weeks, 4 weeks and 6 weeks respectively over a 7 month period.[146]

The principal reasons for this has been the fragmentation of the rail industry in the post privatisation era and the knock on effect of the blame culture that has developed in the industry, (see above).

This leads to the third criticism that because of their quasi-legal status, Public Inquiries encourage an adversarial approach that can hamper the search for the facts. Salmon (1966) pointed to the need for an inquisitorial approach involving a senior judge in cases where matters arise "causing public concern which cannot be dealt by ordinary civil and criminal processes

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[143] Hall, 1999, p. 115.

[144] "Even though the cause was known in two hours", as a caustic Hall commented. Ibid.

[145] *Crash,* Part 3, BBC2, 2000.

[146] Part 1; The Uff/Cullen Joint Inquiry; and the Part 2 Inquiry into Wider safety Issues respectively.

but require investigation to ally public anxiety." [147] The appointment of senior legal figures as opposed to technical experts, is defended on the grounds of forensic ability with information, the ability to chair such forums and to reinforce the notion of objectivity and gravitas.[148]

It also leads to the presence of lawyers representing each of the parties at Inquiries, protecting their client's interests, which leads to the search for blame Regarding disasters, the blame culture is part of a phenomenon that has been commented up on by various academics including Douglas and Horlick-Jones. Thus Douglas (1990) charting a history of risk points to the emergence of risk as blame in the 1980s and 1990s. This she ascribes to a change from societies being hierarchical to being more individualist. This switches the need for society to protect itself from individuals to individuals protecting themselves against the world. As she states:

> How to explain this new concern with risk? It is partly a public backlash against the great corporations. A generalised concern for fairness has started us on a new cultural phase. The political pressure is not explicitly against taking risks, but against exposing others to risk.
>
> [Douglas 1992: 15]

As Fairlie commented about the United States and actions of tort:

> The prevailing attitude in America is that people should be safeguarded against not only negligence but also bad luck
>
> [Fairlie 1989: 17]

Addressing the re-action to disasters more directly, Horlick-Jones (1996) debates the pros and cons of the blame culture on effective risk management, points out that:

> In the modern world, social psychologists argue that blaming plays an important role in seeking to interpret, and to come to terms with, adverse events..... The increasing complexity and reflexivity of technologically advanced societies may, therefore, lead to an enhanced tendency to blame.

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[147] Salmon Royal Commission, para 22.

[148] Thus Woodhouse (1995), A judicial appointment presumed to be apolitical, acts to reinforce the independence and impartiality of the inquiry and to enhance its credibility and legitimacy. Judges also lend dignity and authority and symbolise the serious nature of the investigation. Also Custance 2000.

[Horlick-Jones 1996: 66/67]

The effects of the blame culture has been to introduce an adversarial element into what should be an inquiry into an accident. As Custance said:

> The purpose of lawyers (in an inquiry) is to establish the balance of responsibilities between the parties so as to apportion the burden of costs of compensation.

[Custance 1999][149]

In respect of the Southall Inquiry, the crucial difference between these views of the lawyers and the Inquiry chairman, Professor Uff, couldn't have been clearer. As he commented:

> The inquiry should not mirror court proceedings and it is to retain the essential trappings of an inquiry which is intended to find out what happened with the help of the witnesses. So there is certain tension between my job and that of the advocates who are there to put forward and protect the parties they represent.

[Uff 2000][150]

The adversarial style has been criticised as being unhelpful in inhibiting witnesses from revealing as much as they might. Thus Blom-Cooper:

> The adversarial procedure adopted in the legal system, admirable as it may be for the resolution of defined issues in dispute between identifiable parties, is wholly inappropriate.....the result may be a satisfactory method for determining who should win or lose the forensic contest. It does not aim to establish an objective truth and a wider conception of he public interest.

[Blom-Cooper 1994: 205]

According to Maidment this makes them a 'blunt instrument' in comparison with the HMRI investigatory approach. 'Because they rarely explore the complexity and multiple causes of the accident.' [151]Asked about this and the purpose of finding causation, Christian defended the adversarial style and the use of lawyers; pointing out that cross examination led to a

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[149] Interview with the author, xxx 1999

[150] *Crash*. BBC2, 2000.

[151] Maidment, 1997a. P71

discovery of information that wouldn't otherwise have arisen. In this she specifically pointed to the TOCs' lawyers who helped to expose technical issues that might otherwise have been ignored. This was particularly the case in the Ladbroke Grove inquiry as Railtrack were less than candid about the events surrounding SN 109. Using lawyers at an inquiry also levels up the playing field as companies would employ lawyers anyway, even if they couldn't take part directly. On the down side she conceded that lawyers may have an agenda different to those of the public and may be more interested in the implications of the results of a PI, as opposed to getting to the truth. Something that might reinforce a sense of alienation in the victims/ bereaved.[152]

Favouring the Inquisitorial approach, Blom-Cooper, pointed to the selective use of experts by one chairman as producing a situation where clarity was achieved, unlike a situation in which competing parties produce their own experts to support their own view of the facts.

Another issue surrounds the potential outcomes of giving evidence and Salmon in his 1966 review of inquiries pointed out that the potential for witnesses being prosecuted on the basis of evidence given by them at inquiries would inhibit testimony. This gave rise to the 'Salmon letter' which warns witnesses about the possibility of self -incrimination. At Southall this may have been a contributory factor in the HST driver's evidence where he denied knowing why he was inattentive for nearly 40 seconds. The Ladbroke Grove accident recognised this by granting immunity on evidence given to inquiry.[153]

The fourth issue is that the public inquiry system isn't a standardised one and no two inquiries will be alike either in the breath of their remit, or how they are organised and chaired. Thus the Clapham and Southall inquiries

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[152] Op Cit No 68

[153] Another major factor was the fact that both train drivers were killed, removing the possibility of either being prosecuted for manslaughter. As one solicitor representing a passenger group said to another party. "we won't be giving you too much trouble this time" Private interview.

were given a comparatively narrow remit to discovering the reasons for the crash and underlying causes. Referring to the Clapham Inquiry, Maidment concluded that the remit should have been broader:

> The inquiry perhaps stopped short of challenging the top management responsible for the safety culture that underlay the Southern Region's Signalling Department and shied away from the Government's involvement in the pressures, both financial and managerial, that contributed to the managerial culture...few of the participants were motivated to press the inquiry on this issue.
>
> [Maidment 1997a: 69]

By contrast, Lord Cullen, the Ladbroke Grove Inquiry chairman was given a much wider brief to consider safety issues, including management and regulation from 1988 – 2001, and to make recommendations that may well affect the industry for the next three, or four decades.[154] The chairmen of inquiries are also given a great deal of latitude to carry out their tasks. For example, interviewees pointed to the more interventionist, inquisitorial style of Lord Cullen as opposed to the more languid Professor Uff, who often allowed proceedings to drift. Borodzicz sees these issues as a being a potential problem in hampering the dissemination of information throughout the industry. As Toft concluded looking at several public inquiries:

> Some of the people involved with public inquiries as attendees, interviewed during the course of research, have argued such inquires are not always the formalised, objective, truth searching bodies of the common public perception. Public inquiries have got no laid down formal procedure, are adversarial in nature, have no power to require organisations or individuals to carry out their recommendations, and may sometimes apparently hidden agendas to address.
>
> [Toft and Reynolds 1994: 199][155]

Toft's remarks about the fact that Public inquiries don't have mandatory powers to require the implementation of recommendations hints at something

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[154] Leading to a situation where the final report on the Ladbroke Grove accident and matters arising specifically out of it, weren't published until nearly 12 months after the main evidence was taken. It shouldn't implied though that no technical issues were left hidden during this period and the HSE produced several reports

[155] Also Toft & Reynolds, 1997 pp. 32-40.

else that critics have made about Public inquiries: that there is an alternative agenda being played out. As Birch points out:

> Sometimes a department realises that something has to be done .. Sometimes a department has a delicate problem on its hands and wants a committee, for whose work the department takes no responsibility...Sometimes committees of inquiry are appointed without any serious expectation that their reports will be acted upon. They are there to pacify critics.. to buy time [or] to kill a proposal.
>
> [Birch 1993: 160-161]

Birch was referring to departmental public inquiries, rather than accident inquiries, but in terms of both the public inquiries undertaken by Railway inspectors, or Judicial inquiries recommendations have been adopted whilst others haven't. Such an inconsistent approach has had two effects: to turn Public inqures into alibis for action, and where recommendations have been taken seriously, to distort managerial decisions. Thus recommendations from successive inquiries of different forms and length and technical detail have failed to convince the industry of ATP's worth and to alter the rejection of the installation of ATP. Thus the 1989 Hidden Report into the Clapham Junction crash; the HMRI reports into the 1990 Purley Crash and the 1995 Cowden crash; the 1996 Watford Junction crash; the 1997 Southall inquiry all recommended its installation in preference to other cheaper measures

At the time of writing[156] it isn't clear whether or not the latest Public Inquiry to recommend its installation will be any more successful [157]. As Christian stated:

> The danger with Public Inquiries is that they can become alibis for Government doing nothing.... What ever the (Ladbroke Grove) inquiry might recommend, the TPWS system will continue to be preferred to ATP.
>
> [Christian 2000]

However if recommendations are adopted they may not be appropriate ones as Appleby remarks:

> Often the lawyers and the judges show little aptitude for understanding the complex nature of the circumstances that the inquiry is considering and as a consequence the real

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[156] Summer 2001

[157] the Uff/ Cullen Joint Inquiry into Train Protection Systems, 2001.

causes are missed or mis-understood resulting in the recommendations either being of little use or in some cases detrimental to safety.

[Appleby 1999: 7][158]

Maidment writing about the King's Cross disaster pointed to the concern raised by the Fennel inquiry leading London Underground to become 'obsessed' with fire safety and security issues. This led to distorted decisions about allocating resources, but also to an incident in 1991 where passengers were stranded in the tunnel near Bethnal Green underground station after being evacuated from a train because of a security alert. This led to several casualties, as it was a very hot afternoon and the potential for safety being compromised by issues such as crowd control.[159] Another example on the railways was the effects of implementing Hidden Inquiry in contributing to the Watford Junction crash, of 1996 here it was alleged that one of the main reasons why necessary work was delayed for four years as other recommendations from the report were implemented. [160]

. The last form of inquiry is the increasing use of police investigations. In the Southall Inquiry this was to prove a major area of controversy.

British transport police inquiries

Aside from safety related inquiries, there is also the possibility of an investigation into the criminal aspects of an accident. This has come to prominence with both the Southall and Ladbroke Grove inquiries. These are the responsibility of the British Transport police, (BTP).

The British Transport Police is the national police force for the railways and provides a policing service to rail operators, their staff and passengers throughout the UK. The Force is also responsible for policing the London Underground system, the Docklands Light Railway, the Midland Metro Tram System and Croydon Tramlink.

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[158] Also interview with the author. April, 2000.

[159] See Appleton above.

[160] Maidment 1997a, p. 72. For details of the crash, see Appendix xxxxxx

The BTP deals with all crimes committed on the railways from murder, crimes of violence, sexual offences, robberies, thefts, fraud (including major commercial fraud) downwards. Aside from these, they also have a role in enforcing specific railway offences concerned with safety including endangering safety and obstructing trains which have serious safety implications.

In respect to major accidents it is almost inevitable that the BTP will be involved and possibly launch a separate inquiry. This is certain if there are fatalities, or serious injuries. This power derives not only from the general police powers to investigate and collect evidence about a suspected crime but it is established and defined in the BTP publication, 'The Major Incident Manual' which outlines the circumstances where an investigation is appropriate and the role of the BTP. In this there is wide discretion as to whether this should happen. [161] However, this type of criminal investigation poses a number of problems for the collection and communication of data about safety and future operational practice; all of which were exposed and illustrated during the Southall Inquiry.

The first problem comes with the collection of evidence at the scene of an accident. Here the main problem comes with which agency has primacy in the immediate investigation of the site. This is because the police have the duty to treat any accident as a potential crime scene, with only the saving of

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[161] The definition of a major incident is deliberately loose and inclusive. Thus it is defined in the manual as "any emergency that requires the implementation of one or by all of the emergency services, and will generally include some or all the following features. The rescue and transportation of a large number of casualties. The involvement directly, or indirectly of a large number of people....the large scale combined resources of the police, Ambulance and Fire services. The mobilisation and organisation of the emergency services and support services, for example, the local authority, to cater for the threat of death, serious injury or homelessness to a large number of people. Any officer, from any one of the emergency services, who considers that an incident meeting any one of these criteria has occurred, may delare it to be a major incident." P. 10 Major incident Manual, BTP.

life taking precedence.[162] In this, the presumption is that the site of an accident is also the scene of a crime and it is up to the Senior Investigating Officer, (SIO) to determine whether the police are to be involved. In the case of Southall, this was decided almost immediately given the comments of the driver as he communicated news of the accident to the signal box at Swindon.[163] Following on his/her decision this impacts on the role of other agencies conducting their own investigations simultaneously to the BTP. Thus the HMRI become agents of the police and become the BTP's technical experts; directing the SIO as to what types of evidence should be preserved and protected, along with conducting their own inquiry. This is also the case for Railtrack and the train companies and contractors. Here though there was evidence that the Southall investigation was hampered as whilst relations between the HMRI and BTP were apparently good, [164]it was a different matter with Railtrack, who placed primacy on retaining their experts and those of the companies concerned in the accident, for their own investigation. This led the BTP to co-opt Railtrack's contracted experts, without their consent or consultation.[165] This meant that not only was Railtrack's own investigation hampered, but that any information gathered by their experts would not automatically be released to them.[166] This led a to confusion in terms of what

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[162] Thus Nicholas: the SIO (Senior Investigating Officer), has a legal responsibility to ensure that the scene is preserved to his best ability; the loss of that evidence does make that officer answerable to the law and the courts, 25/10/99.

[163] Specifically pointing to the defect in the AWS equipment and the possibility of negligence on the part of the driver, Uff 2000.

[164] This was stated by Nicholas, but he may well have been diplomatic, as the evidence of Graham Satchwell, the investigating officer in charge of the BTP investigation had caustic comments to make about the HMRI personnel, see later.

[165] As Graham Satchwell testified: " we snaffled those witnesses as the right experts to provide independent advice.", 25/10/99

[166] Again Satchwell: " we couldn't share the findings of those scientific experts, willy nilly with Railtrack."

types of evidence should be preserved and who was collecting what. [167] It also led to a situation where the experts involved didn't know where their responsibilities lay, to the police or Railtrack.[168] Uff concluded that this was unacceptable and that:

> Too many experts were brought in and their role became confused... and there was no overall plan for the technical investigation. Potentially important evidence was overlooked and destroyed.
>
> [Uff 2000: 194-5, para 15.22]

In this Uff placed the blame on the police as co-ordinators. Thus he challenged their competence to direct and instruct experts to collate evidence:

> It is unacceptable that a technical investigation should be directed and controlled by BTP.. technical investigations are conducted for reasons much wider than potential prosecution.
>
> [Uff 2000: 195, para 15,23]

The second problem arises as to when and how the collected evidence, including technical evidence, should be released to assist inquiries into the causes of accidents. The ability for agencies inside the industry to learn from accidents depends in part on the evidence being available as soon as possible. If the police are involved, any evidence collected by other agencies in their capacity as assistants to the police investigation will rest with the BTP. Thus Nicholas:

> The primacy of the evidence gained through an examination will remain with the police, the original of that evidence would generally remain with the police.
>
> [Nicholas 1999]

In the Southall inquiry this was to be the subject of major controversy, as evidence of technical failings collected on the days immediately after the crash and over the subsequent months were withheld from the Industry

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[167] Uff 2000.

[168] again Satchwell: "I did have concerns when I spoke to both AEA technology and Atkins about their state of mind. They were not clear, they clearly did feel some pull towards Raitrack, and, but at the same time felt a public obligation towards the police... I had to tell make it clear to them, just who they were working for. I wasn't clear in their minds as they told me. As was explained, they were there to get the scientific facts, not coloured by any loyalty to Railtrack."

inquiry by the BTP for some 18 months. Satchwell commenting on this admitted its implications for the internal Industry inquiry's ability to discover and communicate safety issues arising from crashes. As the following exchanges between himself and Jonathan Caplin QC., representing Great Western Railways illustrated:

Caplin: *Do I understand from the tenor of what you are saying, that although they have that responsibility, you felt that there could not be proper co-operation between the police and Railtrack in the sharing of expert information, and other information on site?*

Satchwell: *Absolutely. I would go further than that, not only on site, but offsite.*

Caplin: *the effect of this must be that that will, to some degree, hinder Railtrack's duty to further the industry investigation.*

Satchwell: *I entirely agree.*

Caplin: *You've taken their experts, and the results of what the experts were telling you, was not being deliberately communicated to Railtrack.*

Satchwell: *That is correct.*

The reason being that there was a possibility that participants on the internal inquiry would be liable to future prosecution. As the following exchange confirmed[169]

Caplin: *Why couldn't that happen?*

Satchwell: *Bear in mind that that the players in that inquiry, Railtrack, Great Western Railways and so on were also potential defendants. It would have completely frustrated the criminal process to have released all the evidence to that internal inquiry...there was no way that I would allow any contamination of evidence that might have remained available, or might have gone missing by exposing what lines of enquiry to potential defendants.*[170]

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[169] A possibility that came to pass with the prosecution of Great Western Railways in June 1999 for Corporate Manslaughter.

[170] Extract from the evidence to the Southall Inquiry, 25/10/99.

This included purely technical details on the problems connected with the signals that played a crucial part in the causes of the crash. As Uff concluded, the site of the crash was protected by 3 signals: SN270, SN280 and SN254, in that order. The technical report on these signals revealed that whilst SN254 (the final one the driver would have seen coming into Southall), was both well aligned and therefore easy to see and also gave drivers 20 seconds to re-act, the other two were defective or less than satisfactory. Thus both were mis-aligned and thereby difficult to see, making it hard for drivers to re-act to adverse signals, such as yellow, double yellow or red. Moreover, SN280, which was the last signal before the fateful red one on SN254, gave the driver slightly less time to re-act than the bare minimum standard of seven seconds. SN270 gave the driver 9.6 seconds, above the minimum but well below the time recommended by WS Atkins in their report for BTP which stated that good practice decreed that for caution it was best that drivers be given at least 14 seconds to re-act.[171] Challenged about the desirability of delaying the release of such information, Satchwell again acknowledged the consequences for disseminating information and safety. As he stated:

> If there had been another tragedy after Southall and before the compilation of those (technical) reports, and the subsequent tragedy had been attributable to a fault that could have been identified and reported back to Railtrack and had not done so because of my ordering of events, I would clearly be liable for that.
>
> [Satchwell 1999]

However, he once again pointed to the public interest as the reason for the delay, even if it was 'highly undesirable' that the signals were left mis-aligned for seven months before Railtrack were told about them[172].

The reason why there was such delay was because the BTP investigation had from the outset been about much more than the immediate causes of the accident. Rather the focus of the investigation was on the possibility of prosecuting Larry Harrison, the driver of the Great Western High

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[171]. Thus: "Good practice is to ensure that twice the minimum distance is available where this can be reasonably achieved." Vol, 44/163. Evidence to Uff Inquiry

[172] The situation characterised by Cooksey, Uff Inquiry, 1999. Satchwell agreed with him on this point.

Speed Train, for manslaughter and the company itself for Corporate Manslaughter. The causes for this action were the evidence of the taped conversation between Harrison and a signalman in the immediate aftermath of the crash and the fact that the AWS equipment was isolated and the ATP equipment wasn't in operation.

Whilst there was a prima face case against the driver, the attempt to prosecute the company was far more difficult to establish. The effect of this was that the criminal investigation was much slower than might have been envisaged. This and other issues will be discussed at greater length in Chapters 8 and 9, but suffice to say that in terms of disseminating information, the delay had a knock on effect on both the RII report and the separate HMRI technical report. Thus the RII wasn't given the results of the BTP directed investigation until April 1998, seven months after the crash. The HMRI was affected because it was in effect seeking to prosecute Great western Trains twice, once in conjunction with the BTP prosecution and secondly on their initiative under the auspices of the HASWA. Thus by January 1998 they were still negotiating with BTP as to what the parameters of their investigation were to be[173]. These were eventually agreed in March 1998, some 6 months after the accident and continued throughout the year up to the formal charging of GWT on December, 1st 1998.[174] The recognition that this was less than satisfactory came from the BTP's Chief Constable almost two years when he admitted:

> If the present process is to continue a protocol for dealing with the release of technical information and access to technical experts needs to be in place.
>
> [Williams, 2000]

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[173] Report by Victor Coleman, "HSE Investigation into the Southall Accident position as at January 1998." 15/01/98.

[174] Report by RJ Smallwood. "HSE Investigation into the Southall Accident position as at 14th December 1998." 14/12/98.

The final effect of the BTP prosecutions was to delay the official Public Inquiry that followed the crash. The notice of an inquiry into the accident was announced on the very day of the accident, September 20th 1997. Because of the criminal investigation and proceedings, the Inquiry officially commenced on September 25th *1999.*

In summarising the effect of the BTP's role in investigating the crash Uff concluded that:

> While there may be exceptional cases in which the police should play a prominent role, for example, in cases of suspected terrorism or vandalism, in the case of an accident resulting for the process of running the railways, any technical investigation should be directed by an appropriate expert body.
>
> [Uff 2000: 195, para 15.23]

This chapter has attempted to outline the way the management of safety changed in the run up to privatisation in 1993. It posited that such developments mirrored the TQM approaches taken by British Rail in the 1980s, (see Chapter 3). Additionally, it discussed introduction of the risk assessment into the industry and the necessity to collate and disseminate of data on accidents as a vital component of the process. It was shown that the fragmentation of the industry and the way its component parts are related by contract has militated against such dissemination. However, data has to be interpreted within a decision-making framework. For the rail industry this is CBA, (see also Chapters 2 and 4); this is the subject of the next chapter.

Chapter 5: Cost Benefit Analysis in the Privatised Railway Industry

> Costs and benefits that are taken into account in the analysis will either be decided by the client for which you are doing the work, or may be decided by the consultant whilst talking to the client as to which costs and benefits they would take.
>
> [Smail 2000]

> I think it is fair to say that the rules governing cost benefit analysis in the railway industry are not set in tablets of stone.
>
> [Cope 2000]

> There is a strong suspicion, however, that some railway managers have inflated the costs because they do not want to install ATP.
>
> [STAG 2001]

> why, I've believed six impossible things before breakfast
>
> [Alice through the looking glass]

> To save one life is to save the world
>
> [Jewish proverb]

Chapter 4 was concerned with charting the adoption of risk management techniques and some of the problems arising from the replacement of a public sector monopoly, British Rail, with a highly fragmented industry that is the privatised rail industry. This chapter will continue the discussion by considering the implications of using Cost Benefit Analysis as the basis for decision making in implementing safety projects, or technology. In this there will be an assessment of its general utility as well as commentary on its role in determining the rejection of Automatic Train Protection, ATP, despite several crashes in the 1980s and 1990s that it could have been prevented.

The discussion will also posit that the so-called objective nature of CBA is in fact heavily dependent upon underlying assumptions analysts make and are thereby liable to be both contentious and fallible. In this, there are echoes to the debate among risk communication academics about science and the scientific approach, far from being a separate autonomous and disinterested discipline is rather a reflection of the mores and assumptions of the experts who contribute to it. It is also influenced and determined by the dominant paradigms and agendas of the institutional settings in which it is created and the wider social, economic and political values of the day. As Irwin puts it:

> Science is constituted within particular social contexts, and these will shape what eventually counts as certified knowledge.
>
> [Irwin, 1995: 58].

As such they argue that scientific reasoning is to a large degree determined by the assumptions made at the beginning of a research project, with different assumptions producing different scientific conclusions.

This also leads to the notion that government and official bodies don't have a monopoly on such studies. Thus Wynne and Irwin (1996) mention the use of experts by pressure groups such as Greenpeace etc., who hire their own experts to produce different interpretations of the same phenomena - often to reinforce the aims of their commissioning organisations.

This phenomenon is especially important in a fragmented and blame oriented industry such as the railways, given that it's likely that several organisations will sponsor studies on the same technology. By way of illustration there will be an examination of the BR/ Railtrack assessment of ATP, along with two of the many such exercises that have commissioned by parties involved in the Southall and Ladbroke Grove disasters.

Risk Assessment: Methodologies

If gathering reliable data is one element of Risk Assessment, the second major problem for risk assessment concerns the methodologies employed to undertake it. As already mentioned, the rail industry has 25 TOCs and 6 major infrastructure contractors, (see Chapter 3); each of which are required to undertake risk assessments as part of satisfying their safety case requirements. However, such assessments are not prescriptive, and the HSE explicitly acknowledged, (see Chapter 4), that a mixture of methodologies will be used across a range of activities.[175] Theoretically these

[175] HSE 2000, section 4.

are examined by the HMRI. However in reality any examinations are left to Railtrack's safety division as part of their role in ratifying and auditing as individual company's safety case.

It was also the technique used to decide whether or not to adopt ATP in the industry.

Cost Benefit Analysis: a note[176]

> The greatest happiness of the greatest number is the foundation of morals and legislation.
>
> [Jeremy Bentham]

> there is a positive danger in the tendency to treat cost benefit analysis almost like a simple arithmetical problem that arrives at a given definite answer.
>
> [Hender: 9]

> In the absence of ATP there is a 26% chance of an ATP preventable accident involving a GWT train during the next ten years. The political considerations and the very real requirement for senior management effort that such an accident would bring cannot be disregarded.
>
> [Electrowatt 1997]

As already stated in Chapters 2 and 4, the use of QRA developed as the industry sought to replace a reactive approach to safety with a pro-active one. As a part of this, CBA techniques have been employed in assessing the utility of safety measures; using the ALARP principle. In the rail industry it was adopted in reaction to the costs borne by British Rail in the light of the Clapham disaster, (see Appendix 3), and the introduction of recommendations of the subsequent report by Anthony Hidden. These amounted to £700m between 1989 and 1993.[177] Such expenditure was condemned as being the product of:

> knee jerk reactions, heavily influenced by political considerations, pressure by special interest groups, vague qualitative judgements or personal hunches.

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[176] Or RCBA, (Risk- Cost- Benefit – Analysis), as Schaffer- Frachette (1985) defines it, see Chapter 2.

[177] Marris et al, 1993, p. 10.

[Marris et al 1993: 10]

Cost benefit analysis is a technique for comparing the costs and benefits of a project and has been widely used in assessing the validity of public sector projects. In terms of risk assessment, it is used in assessing safety projects by balancing or comparing the costs of implementing a measure, or safety project, against the benefits in terms of the costs saved by averting an accident. In order for this to be done clearly, both costs and benefits are measured in identical units, usually monetary ones. CBA isn't the only available technique but it is extensively used in industry when considering what Ball calls 'remote but potentially catastrophic risks' [Ball 1994:1.1]. In this case CBA exercises are concerned with establishing societal goals as well as the means of achieving them on the basis of utilitarian principles.[178] This proactive approach to risk management is one extolled by academics and practitioners alike, with Toft and Reynolds seeing it as being synonymous with good management, [Toft and Reynolds 1997:2]. In the realm of governmental agency decision making it has been hailed as a panacea for dissatisfaction with political decisions. As Baram states:

> Using this form of economic analysis arguably promotes rational decision making and prevents health, safety and environmental regulations from having inflationary and other adverse economic effects.
>
> [Baram 1980: 473]

But the most important justification that practitioners put forward is that such analysis is an objective method that can be scrutinised and represents a consistent benchmark for decision making. In the rail industry its proponents view it as a transparent and efficient format for making decisions; in contrast to the previous re-active methods which have been condemned as: "Likely to be arbitrary, inconsistent, inefficient, inaccessible to public view and thus difficult to justify."[179] Thus it is politically and legally justifiable - something Marris et al in particular stressed this to British Rail in their report, thus:

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[178] Baram, p478. And Kelman, 1980.

[179] Marris et al, p.11

Safety strategies should be cost-effective yet also publicly acceptable and legally justifiable.

[Marris et al 1993: 8]

However, such contentions are flawed on four counts. Firstly it could be argued that all judgements are to some extent value laden. Secondly the notion of scientific objectivity that CBA attempts to present bars non-experts from sufficient input and thus lessens accountability. Thirdly, there is no one approach to CBA and different approaches and assumptions will yield different results. Lastly, the ALARP principle involves the issue of what is "practical" in terms of safety and what is "proportional" and "gross disproportion" (HSE 1988) in making investment/ expenditure decisions. By extension, this also involves notions of 'acceptable risk', (see Chapter 2). Fischhoff et al, (1981), place the decisions of what constitutes 'acceptable' firmly in the realm of normative factors, thus:

They require a choice between alternatives. The choice is dependent on values, beliefs and other factors. Therefore, they can be no single, all purpose number that expresses the acceptable risk for a society.

[Fischhoff et al 1981:xx]

They further argue that the supposed objectivity of the exercise is undermined by the value judgements needed to translate information into analysis. As Soby and Ball comment:

when considering the risks associated with a particular project, depending on the options, information and values used, very different decisions could be taken about the level of risk which is tolerable and at what price.

[Soby & Ball 1991:36]

The ALARP framework does have an alternative, not As Low As Reasonable Practical, but As Low As Reasonably Achievable, (ALARA); implying that more could be done than is justifiable. In the rail industry this has been periodically urged by the HMRI on Railtrack and individual companies. Thus Coleman in 1998:

I will expect operators to go that extra step in the pursuit of safety, rather than stop as soon as the figures indicate that they appear to be justified in doing do.

[Coleman 1998: q 233]

However this has been confined to urging because ALARA isn't legally enforceable as the weight of the law and statute is with ALARP, (see Chapter 2). This limitation was to be illustrated in the case of ATP, where despite the exhortations of the Inspectorate, the CBA approach decided the issue, (see below).

Finally on the issue of acceptability, both Kelman and Fischhoff challenge the very validity of assessing acceptability of risk in terms other than in economic markets. This is because CBA assumes the existence of a single institution, or authority enabled and empowered to speak for society. As they state:

> CBA is most appropriate for private decisions in areas with responsive markets, immediate consequences and well informed consumers. Decision analysis presumes the existence of an entity (a single decision- maker or group), empowered to speak on behalf of society.
>
> [Fischhoff et al 1981:xx]

In the context of the railways this is deemed to be the HSE/ HMRI who decided the framework for acceptability and tolerability. As public bodies they are deemed to represent the public interest. However, there are three major issues here. Firstly, as explained in Chapter 2, the HSE are a QUANGO charged with executing and enforcing the 1974 Health and Safety At Work Act, (HASAW), but they are not directly accountable to elected officials. Secondly, within the rail industry it was the industry itself that proposed and implemented the CBA approach with all its attendant notions of what constitutes 'acceptable' levels of risk etc. Indeed far from leading and defining societal aspects of risk, the HMRI had to be 'dragged, kicking and screaming' into acceptance of the new approach, [Maidment 1999a]. The third aspect is that far from representing one group, the rail industry is fragmented with at least 125 companies and a myriad of stakeholders, including politicians; regulators; passengers; the taxpayer; interest groups; trades unions; suppliers etc., (see Chapter 3). In such circumstances Fischhoff's remarks seem apposite:

> It is unclear who is empowered to decide that the necessarily incomplete, inaccurate representation of reality found that in even the best analysis has successfully identified the most acceptable notion.
>
> [Fischhoff 1981:36]

Cost Benefit Analysis: the Process

There have been three main types of CBA exercise: the commercial CBA; the social CBA and a mixture of the first two. A commercial CBA will look almost exclusively at those aspects of costs and benefits as relevant only to the company, or organisation that is sponsoring it. The social CBA approach involves taking wider benefits, or avoided costs into consideration. Public sector bodies, typically undertake these (see below). The third type includes elements of both and can take into account the benefits of a particular company decision on the industry in which it operates. The rail industry has seen all of these undertaken by various organisations at various times since the late 1980s.

There are three main stages in any CBA exercise. Stage one involves identifying all the positive and negative effects of the proposed project, or measure. These are then estimated using a common unit of reference. This has typically involved assigning a monetary, or market price value to them. Lastly, a discount rate needs to be applied that can translate perceived costs and benefits over a period of time, usually the anticipated lifetime of the scheme.[180] Each stage has inherent problems.

Firstly, it is generally agreed that there will always be problems with identifying all potential pluses and minuses with precision.[181] Thus factors such as inadequate information, how it is compiled into data and in the uncertainty of projecting into the future. Baram has described this stage as the 'skimpy science' as: "foolproof techniques for forecasting the unforeseen are by definition non existent." [182] Given this, and without sufficient resources and expert personnel to measure indirect effects, there may be 'gross' errors[183]. This is especially the case where risk assessors use fault-tree

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[180] For example Railtrack's assessment of safety projects. Railtrack, (1998)

[181] Thus Marris et al 1993; Mishan, 1975 etc.; Schaffer- Frachette, Barron, 1997, etc. for discussion in the rail industry see above sections on data collection.

[182] Barram, 1980, p. 476.

[183] Ibid

analysis, as errors in estimation will feed into successive stages, thus compounding errors. This is even more so when examining a system as complex as the rail industry.[184] (The problems with using data in the rail industry has already been discussed, (see above) where the paucity of data on major incidents, as well as predictors such as SPADs, was explored).

The second stage is the most contentious area of CBA, the evaluation of human life when computing costs and benefits.

Valuation of Human Life, (VOL)

> The use of a cost benefit where human life is concerned is intuitively difficult to accept...there is no nationally accepted standard as to how one should value certain benefits. It is left to the person performing the analysis to make assumptions and to justify those in the process.....due to the imprecise nature of the process, it would not be normal practice to use a cost-benefit analysis as the only decision-making tool.
>
> [Cullen 2001:155, 8.53]

> It is amazing that economists can proceed in unanimous endorsement of cost- benefit analysis as if unaware that their conceptual framework is highly controversial in the discipline from which it arose - moral philosophy.
>
> [Kelman 1981: 34]

> This is a treacherous topic
>
> [Schelling 1968: 127]

Cost Benefit analysis is tailor made for applying to phenomena where it is usually socially acceptable to being evaluated in monetary terms. Where the methodology becomes controversial is when it is used to assess issues such as safety, which implicitly involves placing a value on human life. In the rail industry this problem has been repeatedly recognised by practitioners as an area of controversy, especially after major disasters.

A number of issues arise from this not least the emotive nature of the valuation of life, or VOL, and the inferences made that the very use implies a trade off between profit and safety. Baram, (1980), asserts that such sensitivities has led to many analysts concentrating on the technical issues, hoping that the underlying ethical questions would 'fade away'. Kelman,

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[184] For example, Marris et al point to the sixteen stages that contributed to the Clapham Rail crash in 1988. Also see Appendix, and Kletz.

(1981) goes farther and accuses CBA practitioners being blind to the underlying morality of making such decisions about creating risk for other people. In this he decries the underlying notion behind CBA that nothing should be undertaken unless benefits outweigh costs. As he states:

> Some acts whose costs are greater than their benefits may be morally right and contrary wise, some acts whose benefits are greater than their costs may be morally wrong.
>
> [Kelman 1981: 35]

Such sensitivities by practitioners have led to a defensive tone in which it has been justified in the public domain at least. Thus Marris et al in their report which signalled the use of CBA in the rail industry stated:

> This is a particularly difficult and sensitive issue since many people believe that life is infinitely valuable and so it is impossible and abhorrent to place a monetary value on such safety benefits
>
> [Marris et al 1993: 13

It has also led to academics and practitioners to prefer to talk about the value of lives saved. Thus Uff and Cullen talk about the value of fatalities prevented, or VFP. As they state:

> It needs to be emphasised that they represent equivalent fatalities avoided and in no sense represent the value of a life that has been lost nor that of any injury suffered.
>
> [Uff & Cullen 2001: 4.23, p. 43]

Besides the ethical and theoretical issues surrounding the VOL approach, there are a number of practical problems. Firstly, unless the processes that are used to arrive at a VOL are made completely explicitly, there is always uncertainty as to what other factors have led to the getting the figure arrived at. There are for example inevitably going to be influences from politicians, interest groups, the media etc. An example here maybe the distortions from companies inflating the figure to improve its image.[185] Associated with this is the other problem that these figures don't have a consistent benchmark figure. For instance, Baram cites several US regulatory agencies each with different figures. In the UK, the NHS VOL is as low as £100,000, whilst the

[185] A notable example from the Rail industry was the attempt by Chiltern Railways to adopt ATP on the basis of a VOL of £7m, as opposed to Railtrack's VOL, £2m. Information from Public Seminar, 2 Cullen Inquiry, Part 2, September 2000.

DETR figure for road deaths is currently £1.15m, whilst the figure for London Underground is £1.4m,[186] whilst Railtrack's figure in 2001 is £3.2m.[187] (It also of course ignores the other damage caused by accidents, such as loss of business, damage to the infrastructure etc.)

Of course the reason for such disparities is that each figure deals with specific contexts, and as such none will guarantee social optimum, [Soby & Ball 1991: 36]. The most important factor though is that different methodologies will produce different valuations and Soby and Ball identify several methods of arriving at an average figure. (It should be remembered that most VOL figures are the result of several exercises, for example BR/ Railtrack, see below). These include valuations based on insurance policies; awards in compensation from the courts, the human capital approach, which bases any valuation on an individual's expected earnings; age; probability of the accident occurring, plus a social discount. Additionally, there is sometimes added an arbitrary amount to acknowledge suffering incurred as a result of an accident. This approach has the advantage of being relatively straightforward, but doesn't include any sense of an individual's perception, or acceptance of risk.[188]

The main alternative and the one adopted by the rail industry is the Willingness To Pay method, (WTP). This is derived from social welfare theory, which does attempt to incorporate individuals' preference into decisions on safety investments. Such preferences are revealed in the monetary trade offs individuals are willing to make for safer travel etc. As Beattie explains:

> Under this approach to the valuation of safety we should ideally like to discover how much people would be willing to pay for improvements in their own (an possibly others') safety.
>
> [Beattie et al 2000:3]

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186 Information from websites and Norman Benet, LUL, February 2001.

187 Woolmar, C *Rail News June* 2001.

188 Marris et al, p.15.

In the rail industry, this has taken the form of using work based on psychometric perceptions of risk, (see chapter 2). However, this will be shown not to be either the most accurate, or appropriate of methods, (see below)

The final stage of CBA is the discounting of costs and benefits over time. Most public sector projects, and private ones too, that involve CBA will develop over a period of time, sometimes several years. This too is a contentious area, with the crucial determinates being the degree to which future benefits are discounted and over what period of time is chosen. In the rail industry this has centred on the controversy over whether ATP technology should be installed exponentially, or as a stand alone project, (see below). The controversy arises again about the appropriateness of applying the concept to human life as Mendeloff & Kaplan state:

> Just because the deaths prevented by one programme occurs a number of years in the future it is no reason to treat them as less valuable than deaths prevented now. People in the future are just as valuable as people now.
>
> [Mendeloff & Kaplan 1989: 354]

In this area of uncertainty, it is up to the individual analyst to make up his/her own discount rate and defend it. Again Baram reviewing US agencies pointed to various examples where discounting was criticised for suiting the most favourable outcome. In the rail industry BR/ Railtrack used the standard public sector of 8%, but an illustration of the variations possible came with the exercise undertaken by Thames Trains after the Southall disaster, see below. Summing up the problems of CBA, Baram makes the point:

> Users of CBA can easily play a "numbers game" to arrive at decisions that promote or justify agency actions reached on other grounds. The purportedly objective framework of cost-benefit analysis can be used to promote rather than analyse options by manipulating the discount rate, assigning costs and benefits, excluding costs that would tilt the outcome against the preferred option and using self serving assumptions about distributional fairness.
>
> [Baram 1980: 489]

To illustrate this point the following discussion provides an example of CBA used in the rail industry in conjunction with the ALARP principle. This was the rejection of the introduction of the Automatic Train Protection technology (ATP) in the early 1990s and the continuing reluctance on the part of experts in the industry to adopt it, despite a number of multiple fatality crashes it would have avoided.

CBA in action: The rejection of ATP

> (the UK is) just about the only country left in the world that runs high speed trains and mixed traffic without the benefit of modern ATP systems that prevent the driver passing signals at danger
>
> [Howker 2000]

> I think I have said in some of my recommendations it's (ATP) the sort of investment that can't be justified under any of the normal criteria... there is a problem being made by drivers that can really, in the long run only be addressed by Automatic Train Protection.
>
> {Cooksey 2000: 4646]

ATP is a generic term for a range of technologies that monitor a train's speed in relation to the signal and track restrictions and are designed to limit a train's speed in relation to them. There are three main types of driver error in relation to signals. These are respectively passing a signal at danger, known as a SPAD; failing to control speed approaching the buffer stops at termini; and going too fast on curves and over designated speed restrictions. ATP can prevent all of these. Thus if a driver is driving too quickly, or is in danger of passing a red light, as s/he approaches the signal, the equipment warns him/her to slow down. If this is ignored then the equipment automatically intervenes and applies a brake which cannot be overridden. Such technologies supersede the existing system known as Advanced Warning System, or AWS, in that the discretion of the driver to ignore warnings is removed.

ATP was first mooted for use on UK railways in the early 1980s and its' development was proceeded with by British Rail. Their intentions were bolstered by accidents at Purley and Belgrove Junction both of which would have been avoided if ATP technology had been in use.[189] Additionally the Hidden report into Clapham Junction disaster recommended installation even

[189] Purley, 4/3/89. 5 fatalities, Belgrove Junction, Glasgow, 6/3/89. 2 fatalities. See Appendix 3

though it wouldn't have prevented the crash itself.[190] The result was that pilot schemes were introduced on BR's western zone (the line later franchised out in 1994 to Great Western Railways), and what became Chiltern Railways. The pilots proceeded with BR in control of track and operations including training drivers and between 1991-1994 the trackside infrastructure was extended from Bristol Parkway station to within 12 miles of Paddington station in west London. By this time a total of 358 signals had been fitted and all of the Great Western zone's power cars converted.[191] However by 1996 neither scheme was in operation and their future was in a state of 'uncertainty'.[192] This was for a number of reasons. From Railtrack's point of view the issue and been primarily one of the technical complexities of introducing a system that could cater for both suburban and High Speed Train (HST) traffic.[193] However there is no doubt that there were other reasons. Prime among them was an internal BR assessment of its cost effectiveness. As the HMRI official Cooksey testified:

> Prior to 1994 (It) was an intention of the industry to proceed with ATP, almost regardless of cost......What changed in 1994 was the British Rail board coming forward with an argued case, that the cost of ATP despite their position previously, could no longer be justified in any form of assessment.
>
> [Cooksey 2000, 4647]

The rejection of ATP

> Taking all the work together and using the figures most favourable to ATP, one is left to conclude that – whatever assumptions are made – there is a considerable gap between costs and benefits of a significant ATP installation.
>
> [Maidment 1997: 229]

> We have been discouraged by the expense of fitting automatic train control systems by narrow minded cost/benefit analysis which measure the benefit of potential lives saved but neglect a whole raft of system wide operational benefits, including increased capacity and reduced maintenance cost.

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[190] Recommendation 46.

[191] Uff (2000) para. 13.5-13.6.

[192] Uff, (2000) para 13.7, p.153.

[193] Rayner, D Evidence to the Select committee on Transport, 13/06/96, qq551-552.

[Smith 2000:13]

The BR assessment was the product of the new pro-active safety management systems brought in by Maidment and the safety directorate team, who had begun to assess the viability of installing the system nationally

The decisions that were made about ATP were predicated on an analysis of the costs the project as against the benefits in terms of lives saved. This involved an estimation of the likely number of future fatalities that could be prevented, and the value this represented.

This was done on the basis of the ALARP principle utilising the cost benefit analysis, based on their valuation of a human life of £2m, (see above and below). In this they were treating a safety project in exactly the same way as any investment project. [194] Thus the total costs of adopting ATP were estimated at £760m, including £545m installation costs and £260m net operational and maintenance costs. This was then compared against an estimate of the number of lives that ATP would save over the same period. Analysing the accident data from 1968-1993, (table 1), did this. The data was gathered from public and industry inquiries and longitudinal statistics of rail statistics, and making a judgement as to whether ATP would have prevented them. In this they were relying on public/HMRI reports. The results were that

[194] Thus Maidment, 1994: "In making a decision whether or not to spend large sums of money to introduce an improvement in safety like ATP, railway management has taken the view that it has to approach the issue of safety broadly in the same way as it would for any new project or investment. Costs and benefits are analysed and compared to ensure that the available resources are directed to where they are likely to bring the best return. This is the approach recommended by the Health and Safety Executive for industrial safety generally, and it is endorsed by Sir Anthony Hidden in his Clapham report."

there were 26 preventable accidents accounting for 70 deaths, an average of 2.29 per year[195].

Table 2: ATP preventable Fatalities and Injuries, 1968-1993

	Fatalities	**Injuries**
Staff	21	76
Passengers	49	2169
Public	0	3
Total	70	2248

Additionally ATP avoidable injuries averaged at 9.8 per year. As BR counted a serious injury as being the equivalent of 0.1 fatalities, this brought the equivalent number of fatalities to 4.3 per year. (It should be remembered that these are arbitrary figures.[196]) Any such benefits were then discounted at 8% over a 20 year period. Based on this analysis the directorate came up with the figure of 52 lives that would be saved if the ATP technology was introduced, see Table 5, which summarises the cost-benefit equation. In fact the final figures were the result of negotiation and compromise between the HSE and BR/Railtrack.

[195] Marris et al (1993), p.56.

[196] Evans, 1996, p. 108.

Table 3: ATP Costs and Benefits (£m) [197]

Installation Costs	**545m**
Operating and Maintenance Costs	**+280m**
Damage and Disruption Avoided	**-65m**
Net Total Costs	**760m**
Lived Saved	**52**
Cost per life Saved	**14m**

Thus the cost of saving a life by introducing the technology would be £14m, some seven times the maximum BR/Railtrack were prepared to pay. Additionally, Railtrack entered a number of extra factors into the calculation. These included the effects of selective installation of ATP at termini in major cities and factoring in a scenario where ATP technology prevented a disaster causing 50 deaths.[198] As the BR/Railtrack report stated:

> In the board's view it has to be accepted that a catastrophic ATP preventable accident could take place at any time..(this) would swamp the base line calculations which are explicitly based on the historic record...it is necessary for decisions on ATP to recognise this extreme uncertainty.
>
> [British Rail 1994][199]

This had the effect of raising the average number of deaths prevented and thereby lowering the cost per life saved. [200]Including these new factors

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[197] Op Cit, No.48.

[198] See Armstrong's evidence to the Joint Inquiry, 2000.

[199] Entered in the Part 1Inquiry as document 9/139. 6/7/00.

[200] Indeed they estimated that a crash involving 100 deaths would raise it from 4.3 fatalities to 8.6 p.a. British Rail, p318.

brought the figure down to between £6m-9m,[201] still a factor of 3 to 4 times higher than the value of life figure established by BR and adopted by Railtrack. Thus when comparing costs and benefits British Rail, and later Railtrack, concluded that the project was cost ineffective, as compared with other, 'softer' projects including driver retraining. [Maidment 1995, 1997,1999][202]. Additionally, the same techniques outlined above were used to gauge public perceptions of the type of large scale disasters technology such as ATP could avoid:

> The concern of rail management in attempting to draw conclusions on ATP in particular, and major accident prevention measures in general, is whether the differing circumstances of railway accidents influence passengers in the value they place on life, and then willingness to pay, taking account of the public perception of the risks involved in travel by train.
>
> [Maidment 1995: 58]

The decision not to introduce ATP was taken and communicated to the HSE, who in turn informed the then Secretary of State for Transport, Brian Mawhinney. His correspondence with BR and the HSC was a classic reaffirmation of an elected official's wish to distance him/herself from decisions concerning risk, (see Chapter 2). Thus:

> Accidents...that ATP would prevent are infrequent and account for about 3% of fatalities and injuries...British Rail and Railtrack have advised me that the network wide fitment of ATP as piloted is not justified because the costs far outweigh the benefits. The HSC has endorsed this view and, furthermore, considers that there alternative investments that would be likely to yield greater effectiveness in terms of lives saved, and better value for money.
>
> [Mawhinney 1995]

What the answer doesn't reveal is the degree of complexity involved in the decision making between the interested parties. Thus in its letter to the Secretary of State (then John MacGregor) in March 1994, BR seemed to favour at least a partial application of ATP on the network as well as its

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[201] Maidment, 1994; Evans, 1996.

[202] This correctness of this decision was to remain the view of the decision makers even in the light of Southall and Ladbroke Grove. Private Interviews with Maidment and Railtrack staff.

gradual introduction while signalling was upgraded. [203] More pertinently however they also recommended that the pilot schemes on the western zone be allowed to continue and develop.[204] But they were also careful to stress that because of the imminent privatisation of the system, they were no longer in a position to deliver these recommendations and that there needed to be an industry wide consultation, as well as input from the HSE/HMRI. This took the form of a major transport safety conference in 1994, when representatives from the industry and regulators met to consider the future of ATP trials and implementation.[205] This conference discussed the issue explicitly in terms of cost effectiveness of the new system and reaffirmed BR/ Railtrack's decision. Further, the appropriateness of CBA approach was posed and justified by Railtrack, in the shape of David Rayner, their safety director at the time. Thus on ATP he was plain:

> we have a cost per life over treble the highest value of life which has been suggested as an appropriate criterion (the DOT figure for road deaths, £715,000)....We have looked at the various factors which have been put forward as casting doubt on the apparent conclusion, and they do not bridge the gap. Cost Benefit Analysis does seem to deliver an unequivocal answer.
>
> [Rayner 1994]

On the CBA approach, he saw its use as vital for the evolution of rail safety projects:

> If the decision is to reject Cost Benefit Analysis as we have applied it to ATP, the matter does not end there. The railway industry - and others – need to know the rationale, because it has implications elsewhere. If society is telling us to take a value of life in major accidents as – say - £30m, then that has implications well beyond ATP. It might imply a large capital programme for the railways. Alternatively, if the value of life on the roads remained at £715,000, it might imply shutting down the railways and expanding the M25 to 14 carriageways in each direction. Transport safety is much too important for those who take or influence decisions in our society – through Press, Parliament or Government – to indulge in inconsistency.
>
> [Rayner 1994]

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[203] Precisely Railtrack's position six years later in evidence to the Cullen-Uff inquiry into train protection systems. Evidence of Roderick Muttram to Uff-Cullen inquiry, 2/11/00

[204] Letter to Secretary of State, from Sir Bob Reid, BR Chairman 31/03/94.

[205] Value for Money in Transport Safety, BR/Railtrack Conference, July 1994.

In December 1994, the HSC gave their formal advice to the Secretary of State, despite the findings of their own inquiry into a fatal accident at Cowden, Kent, which argued again for ATP to be installed. [206]These conclusions were reaffirmed at another conference six months later. The unanimity here was such that the Chairman, Tony Taig, commented in an interview with the author that he had never found it so easy to sum up views expressed in a conference saying:

> Cost effectiveness and transport safety have to be considered together; the tragic alternative is that we live with the very opposite; costly and ineffective recipes for transport safety.[207]

CBA and the Railways: Some problems

> Assessment of risks is also dominated by 'hardware' issues and a rigid use of quantified risk assessment (QRA)....the approach to SPADs is an example of this.
>
> [Bacon 2001]

> of equal concern are risk assessments which at first sight seem to be detailed and analytically thorough, but which on further examination, are found by the HMRI to be seriously flawed, based on false assumptions or a misunderstanding of the legal requirement.
>
> [HMRI 1997: para 73]

> (Public) Inquiries quite rightly consult as many experts as possible. But these experts will frequently differ substantially in their interpretations, and their expertise will relate to different aspects of the incident and be grounded in their particular academic or professional knowledge.
>
> [Borodzicz 1995]

However there were a number of issues that the seemingly objective exercise failed to include, including the underlying assumptions made in the exercise. These included all the problems inherent in CBA exercises as discussed above. Thus there were problems with the data and how it should be interpreted, the Valuation of Life figure and the way CBA exercises were undertaken by the various parties involved and their assumptions. As suggested by Irwin and Wynne (1995; 1996), experts from various disciplines

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[206] Appendix 3

[207] 'Cost Effectiveness and Transport Safety: Is there a contradiction?' 19/01/95. Interview with author January 10th 2000.

and representing the different parties all brought to bear their training on to the analysis, including statisticians; economists; engineers; risk analysts; regulators and academics in risk management. The divergence of views and approaches can be illustrated by looking at their studies.

Accident Data

The first problem was the use accident data in predictive exercises of ATP preventable deaths. The first problem arose with the accident data available to them, and Evans in particular pointed to the comparative lack of data on which the decisions are made[208]. Indeed this is one of the main criticisms made in general about the use of accident data in shaping risk assessments[209]. There was disagreement over this effect, with HSE's analysis pointing to average number of deaths saved being between 5.5 and 6.5 and Railtrack's estimate being between 4.3 and 5.5, with the emphasis being a figure towards the lower end of the range. The eventual calculation estimated that it would save 5.5 deaths, 'in the spirit of compromise.' [210] In all of this, no analysis included the deaths of railway workers.

The lack of agreement on the effect of ATP on saving lives wasn't confined to operators and regulators and academics too have disagreed about the cost effectiveness of ATP, as opposed to any alternative system, based on different assumptions and approaches.

Academic work on the subject of accident trends has been spearheaded by Professor Evans of UCL, whose work over the years has been sponsored by all parties in the industry as well as academic bodies such as the ESRC and EPSRC. Thus he has published several papers on the subject projecting actual data for accidents from 1968-1999 in order to predict

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[208] Evans 1996 p. 108. Also Armstrong, 2000: "the data is a bit thin."

[209] Royal Society, 1992, p 19; Cohen, 1996, p 88. For the rail industry see the above discussion.

[210] Appendix, 12b HMRI *Railway Safety Report.* 1994/95.

ATP preventable fatalities on to 2029,[211] concluding that it would save an average of 5 fatalities per year over the period. But his work was severely criticised by representatives of the parties at the Uff/ Cullen Inquiry into train protection systems. These ranged from practical issues such as the effects of choosing the period 1969-1999;[212] the making of assumptions about the growth of rail travel in terms of train frequency, instead of concentrating up on how the number of passengers per kilometres would grow over the period. An example of this was the estimation by the Strategic Rail Authority, (SRA) in 2000 that already passenger miles were the highest since 1946 – on network half the size[213]. Other issues included ignoring likely improvement in crashworthiness of trains as the Mark 1 rolling stock is replaced, and the effects of increased speed of trains as technology advanced.[214] As to measuring SPADs,[215] whilst he identified a significant difference between

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[211] See Evans, 2000.

[212] Being dismissed as "arbitrary" by Railtrack's legal representative, Roger Henderson, Q.C. The relevance here is that Railtrack's experts argued that it should have been 1967-1999, which would have presented a much more favourable picture for not adopting ATP; Railtrack's original decision. One example of Borodzicz's argument about expert disagreement, Borodzicz, 1995.

[213] Evans admitted the difficulties as such when referring to the estimates based on the Government's projections in their 10 year plan 2000-2010. He concluded that it was difficult to discover the number of passenger/kms for any given year. Evidence to Joint Inquiry, September 19, 2000. The issue of Train kms was also revealed to be problematic with Evans, HMRI and Railtrack all disagreeing on the past figures and projected growth.

[214] Thus in the period the top 6 crashes in terms of speed accounted for 64 fatalities, or 10.64 fatalities per crash, as opposed to Evans' overall average of 5.

[215] NB SPADS are one of the main predictors for train collisions and serious accidents.

typologies of SPADs [216] his projections on fatalities made no account of it. Lastly, in his analysis of accidents he only considered those that led to fatalities, ignoring 'near misses.' In this he mirrored the general tendency in the industry to focus on frequency, rather than potential outcomes when examining the potential for ATP to prevent accidents. This was ironic considering his original criticism of the HMRI for doing the same thing.

Of more importance were the theoretical disagreements of using statistical analysis alone. Here the chief problem was Evans' concentration on averaging out the sum of accidents over a period of time, and not taking a complementary qualitative approach to examining in depth those accidents, which resulted in multiple deaths. Thus Beck argued that the year on year comparison for accident rates ignores the fact that a significant proportion of accidents happen in the context of isolated disasters. As another expert, Dr Smail commented:

> It is important to consider the maximum anticipated casualties that are likely to act, occur with a fully loaded train at peak times because the averaging can mask important predictions.... Within the offshore industry simply taking the number of man hours at risk and then looking at the number of fatalities that occur would not give any indication that an accident such as Piper Alpha could occur.
>
> [Smail 2000]

As Evans is a statistician by training perhaps it wasn't so surprising that he should ignore such qualitative issues, but the possibility arises of experts distorting the process by basing their analysis on their perceptions, as Borodzicz remarks:

> Experts will frequently differ substantially in their interpretations, and their expertise will be grounded in their own particular academic or professional knowledge.
>
> [Borodzicz 1995: 145]

Also Scraton on the 1989 Hillsborough disaster:

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216 Specifically the difference between 'plain line' SPADs where there is little prospect of SPADs leading to collisions and 'conflict' SPADs such as at junctions where there is the possibility of a collision.

Experts fit theories and theories arise out of what assumptions demand; not necessarily those demanded by fact.

[Scraton 1992]

Thus the engineer, Dr Simon Walker representing ATOC condemned the statistical approaches implying an objective and definitive measurement:

In its greater use of sophisticated statistical methods, particularly when applied to very small samples, the Evans' work risks giving a misleading impression of precision.

[Walker 2000]

To which Evans replied:

You've got to the best you can with the data you've got.

[Evans 2000a]

Sir David Davies in his report on train protection systems stressed that Evans' methodology provided at best a 'good pointer' to trends and that its' greatest use was as an indicator of the comparative cost effectiveness between competing systems in a broadly similar environment, but not as a definitive mechanism for decision-making. [217] Cartledge, representing the London Passenger Council couldn't help a wry comment on the degree to which experts disagreed, or disputed with one another when he addressed Beck's evidence thus:

I will not draw you on the apparent paradox of an expert (Beck) coming here to warn us against the overconfidence of other experts.[218]

The second element in constructing a CBA is an estimation of the value of human life. Here too experts differed on what was the most appropriate figure.

British Rail and the Valuation of Human life (VoL)

As outlined above, valuation of life exercises have typically involved use of the willingness to pay (WTP), methodologies. As Maidment explains:

The concern of rail management in attempting to draw conclusions on ATP in particular, and major accident prevention measures in general, is whether the differing

[217] Davies 2001, p. 29

[218] Joint Inquiry, 10/10/00.

circumstances of railway accidents influence passengers in the value they place on life, and then willingness to pay, taking account of the public perception of the risks involved in travel by train.

[Maidment 1995: 58]

The issue of the valuation of life has been controversial issue in the rail industry, especially following the Southall and Ladbroke Grove disasters, with experts both inside and outside the industry disagreeing on methodologies.

The use of WTP originated with the increasing importance of risk techniques pioneered by the nuclear industry and the adoption by the Health and Safety Executive. When the HMRI switched from the Department of Transport to the HSE, WTP and the use of psychometric methods to inform VoL became increasingly important.

British Rail's thinking on VoL matter dates from the late 1980s, (see above), and was determined by a number of factors. Firstly they adopted the Department of Transport figure for road deaths at £715,000, as determined by the WTP method.

Additionally, British Rail commissioned the University of East Anglia, (UEA) to conduct research into issues such as willingness to pay arrived at the figure for this, based on perceptions of risk associated with rail travel. In doing so they conducted a classic CBA methodology which weighted various factors including who was in control of the risk as against who benefited from the activity.

In this they utilised existing principles from the work of Slovic et al (1978, 1993 various). Part of this involved drawing on psychometric studies of public perceptions of train crashes. These have included road and rail transport such as Kraus & Slovic. They devised 49 different scenarios, all of which included common factors including type of train involved; type of cargo (including passengers, freight, and hazardous freight). Location of incident (in tunnels; the open air; underground; in urban or rural areas; typology of accident (2-3 train crash, derailment, fire etc). The sample population were then asked to rate each of the scenarios in terms of risk and the resources that should be devoted to prevent its recurrence these were then cross referenced against the usual factors measured by psychometric theorists.[219]

The results affirmed the importance of unfamiliarity, involuntary exposure the potential for catastrophic consequences. However compared with the studies of heterogeneous hazards, 'Dread' was less important and the degree to which people felt that the scenarios were beyond their control. Picking up on this research, British Rail did identify in 1993, the issues of the lack of control and the 'dread' factor associated with multiple death accidents as determining factors in risk perception.

The resulting evaluation concluded that the cost of human life to be used would be a maximum average of £2m. It was this evaluation that formed the basis of the original decision not to adopt ATP.

> A review of all available research world-wide on valuations stemming from public risk perception, carried out on our behalf by the University of East Anglia backs up the evaluations we have made, although we have used different weightings within sensitivity tests which have caused us to consider the justification of ATP installations using VoLs of £3 million or even £4 million per life saved.
>
> [Maidment 1995: 62]

Such statistical studies raise two issues. Firstly, that the rich complexity of reality makes objective analysis impossible and data sets unmanageable. Secondly in attempting to move decisions about safety away from the people that manage safety at the front line, we move risk management into the hands of statisticians and accountants who are more likely to choose variables that are appropriate to their respective methodologies. By definition this by definition excludes those variables that aren't deemed appropriate. This can be seen in the case of VOL.

Valuation of Life and the Railways: Some Problems

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219 Including the familiarity of situation and the degree of control they have over the situation control. The degree of dread attached to incidents involving multiple deaths. Also the degree to which risks were seen as been shared equitable and the degree of novelty and newness to science and society.

In making their assessment of ATP VoL was arrived at by a combination of the Department of Transport VoL, as estimated from WTP analysis, and societal concerns as revealed by psychometric factors, such as the 'dread' factors etc., associated with multiple fatalities, (see above). However, a number of studies have questioned the validity of the approach as applied to the rail industry and hence the appropriateness of the VoL figure arrived at.

However, before discussing this it should be noted that the headline figure arrived at in the1990s and updated for inflation since hides the fact that they operate several VoL estimations across different situations; being determined by the extent to which individuals have influence, or control over their actions. Thus for accidents such as those involving level crossings and victims who suffered as a result of performing an illegal act, or were in some way responsible for the accident the DoT valuation was used.[220] This section will concentrate up on the figure where individuals have little or no control over the risk they are exposed to, i.e., passengers on trains, and to some extent contracted staff.

Thus Jones –Lee in a series of reports has questioned the validity of the effects of the 'dread' factor of disasters such as Ladbroke Grove etc., on both perceptions of risk and the consequent concerns about safety investments on the railways as well. The first survey in 1994 concerned London Underground. This tested the 'dread' factor associated with accidents involving large scale loss of life in a single event, and whether people would value the fatalities prevented significantly higher than on, say, the roads where multiple fatality accidents are relatively rare. [221] In this he was testing the notion of societal risk as proposed by the HSE, (see Chapter 2). In his research aims, Jones–Lee posited that the 'dread' factor would be significant. The basis of this presumption being that WTP exercises are explicitly

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[220] Interview with Maidment, 1999 and Jones-Lee, 2000.

[221] Jones-Lee & Loomes, 1994. Who undertook qualitative research involving 30 focus groups that used the Underground.

designed to reflect the preferences and attitudes to risk of those members of the public who will be affected in which the values are to be used. Thus it does by no means follow that underground or rail users should have the same attitudes to the willingness to pay for extra safety expenditure than say road users.

However, contrary to expectation, this association wasn't upheld. Rather, the opposite was the case, and underground users had no markedly different preferences than road users. Jones-Lee posited several possible reasons for this; the most likely being that people took the view that, because the causes of a large scale accidents are so unique, it would be preferable and more cost effective to spend money on the prevention of the more predictable single fatality road accidents. Their views were summed thus:

> One would have no real way of knowing in advance that funds expended with the aim of reducing the risks of large scale accidents would be equally effective in preventing the unique combination of human and system failure that typically gives rise to such accidents, than pouring money into particular kinds of system and procedure which might, in the event, have no impact whatsoever.
>
> [Jones-Lee & Loomes 1994: 33]

Evans and Morrison (1997), who stated that any effect of a disaster on the underground was likely to be temporary, reiterated this view.

What Jones-Lee did find was that it was the notion of lack of control and involuntary exposure to risk that concerned the underground travellers, making them willing to spend more on safety.

Jones- Lee followed up the study, with others in 1998 and 2000, or post Ladbroke Grove, making WTP comparisons on train travel with three other hazards, including road travel; domestic fires and fires in public places. Unlike his 1994 study this included the factor of loss of control. Specifically, they asked respondents to rank their preferences regarding reductions in risks of premature death from those hazards. This study found the relative concern of rail travel over road travel was not a factor of *three* as the HSE inspired BR/Railtrack analysis implied but was in fact less than one[222]. As he stated:

> . The outcome of the work that was conducted in 1998 was that somewhat to our surprise, the value of preventing a rail fatality relative to the corresponding figure for the roads produced a ratio of less than one. In fact, if one uses the most direct way of analysing the data, the ratio of the value for the rail fatality prevented vis-a-vis the value for the road fatality prevented, the ratio is about 0.834.[223]
>
> [Jones-Lee 2000]

These conclusions were drawn from a psychometric study of individuals' concerns about the hazards. The factors were respectively: expert knowledge; dread; voluntariness; personal control; scale; and fatality/number-event.

On expert knowledge, it was felt that rail experts' knowledge was the least complete. This led individuals to look at absolute numbers of fatalities when considering baseline risk, as opposed to experts such as Professor Evans who use indicators such as fatalities per train km/ passenger km, (see above).[224]

As to the 'dread' factor associated with multiple deaths, again rail travel was the least feared, even behind domestic fires. The categories that there were most concerns about rail related to the (in) voluntary exposure to risk and the degree to which people felt they were in control. The other category was number-event where they felt that train crashes were the most likely hazard to cause multiple deaths. However, even here only 42% felt that they would be willing to pay more because of this.

Overall, rail travel was rated so low because the respondents felt that the absolute numbers of deaths were low and thereby their exposure to risk was similarly low.

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[222] See above discussion on BR's VoL and Jenny Bacon's written statement to the Joint Inquiry 20/09/00.

[223] N.B. The VoL figure for road safety projects was £714,000.

[224] Beattie et al, p. 19.

The implications of this are plain in terms of the VoL figure adopted by Railtrack. Rather than supporting a £3.22m valuation[225], the research points to the generosity of Railtrack's valuation:

> If one said to me, "of Railtrack's values, which can be defended as being appropriate for use in a conventional social cost benefit analysis?" I would have to say that, on the evidence that I have available to me, it is the £1.15 million figure. But if one is to defend the £3.22 million figure, then one has to adduce considerations other than the pure preferences of members of the public, as such. Whereas empirical evidence tends to confirm the appropriateness of the lower value per fatality as a reflection of the public's valuation of rail relative to road safety, it offers no corresponding support for the higher figure.
>
> [Jones-Lee 2000]

Jones-Lee in his evidence to the Joint Inquiry, recognised that there had been shortcomings in the study and as it was a representative survey of the public, it was probably skewed towards people who are car drivers, rather than rail commuters etc.,[226]. A follow up study conducted in January/ February 2000 deliberately shifted the emphasis towards rail commuters and users of London Underground, in the wake of the Ladbroke Grove disaster. [227] This was partially to redress the previous study's perceived problems, but also to examine the role of the media in highlighting risk, as posited by the social amplification of risk school[228]. This found that the 0.834 factor of relative risk vis a vis road safety estimated in the 1998 study was now 1.003, or virtually the equivalent figure the DETR has for road accidents of £1.15m[229]. All of which raised the question as to which survey should be referred to, given the immediate effects of a highly publicised disaster. As Roger Henderson QC. remarked:

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[225] The current (2000) Railtrack VoL.

[226] Indeed the main aim of the 1998 study was directed towards analysis of risks connected with roads, in comparison with the other risks.

[227] Thus 40% of the population surveyed should be regular rail users.

[228] See for example the work of Kasperson and various.

[229] For high rail users it was 1.157.

Should you use the one that, as it were, reflects, for want of a better term, cool collected reflection pre the occurrence of a large and horrific accident, or should one use the preferences that are inevitably influenced by the occurrence of that dreadful thing?

[Henderson 2000][230]

In reply, Jones-Lee stated that the increase in risk relativity was a comparatively minor one and in the overall schema was irrelevant:

I take some comfort, however, in the fact that, as I have said, the difference between the pre and post relativities is really very small. Had we been talking about a threefold increase as a result of Ladbroke Grove, I really would have been worried. But the fact is it is really very modest. I would be astonished if the use of one figure rather than the other actually turned over a decision. You really do in this area need two or threefold differentials for it to really kick in. That is not to deny that the actual occurrence of a large -scale accident causes widespread distress and horror.

[Jones-Lee 2000]

The revised VoL was still only some 36% of the Railtrack VoL. This comparative lack of influence of the crash at Ladbroke Grove on the public was reflected in another contemporaneous study undertaken for the HSE, by Dr Judith Petts.[231] This was designed to measure the effect of the reporting of the Ladbroke Crash on perceptions of risk and which was again gauged in terms of other risks and hazards. Ladbroke Grove happened part way through the research, and the survey was adapted and extended[232]. Thus before Ladbroke Grove the respondents responded to prompting about railways almost entirely in terms of consumer issues such as punctuality and hygiene. The events at Ladbroke Grove prompted them to include more focus groups in commuter towns. Here discussion was more focused on accidents, with the mediator raising the 1996 Watford accident, (see Appendix 3). Here discussion focused on several issues including blaming the driver, leaves, and public/private debate, not risk as such. As she said:

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[230] Legal Representative for Railtrack at the various Public Inquiries.

[231] 'Social Amplification of Risk: The Media and the Public' HSE Contract Report 329/2001. Dr. Petts is Director of the Centre for Environmental Research and Training, Birmingham University.

[232] As reported to the SRA Europe Conference, May 2000.

Discussion was peppered with fragments of mediated accounts, which have become hackneyed components of media disaster reports.

[Petts 2001:45]

Concerning Ladbroke Grove the conclusions drawn by the researchers were that although the experiences were mediated through the media, the commuters nonetheless rationalised the risks in terms of choice being fatalistic.[233] Non commuters rationalised their comments in terms of comparisons with road travel, using expert evidence to stress that even after the crash, rail travel was safer.

All of these studies sought to rank risk on trains with other hazards, but Petts' analysis hints at the relative priorities of concern of risk vis a vis other issues, particularly consumer related ones. In this her work echoed a survey undertaken by *Which* magazine in January 1999 which placed safety and security on trains as 7th in passenger concerns, behind issues such as punctuality; availability etc. On further analysis, even this category dealt with personal security - i.e. crime - rather than concerns over train accidents.[234] These surveys point to any effect of catastrophic accidents as being relatively short lived and diffused off into other issues that aren't necessarily related. Thus representatives of the Regional Rail Passenger Councils detected a sense of 'unease' following Ladbroke Grove which manifested itself in a reported increase in complaints about overcrowding, but no concrete concerns. [235]

What these surveys have pointed to is the imprecision of data for making VoL evaluations and the essential subjectivity of some of the elements. As Jones -Lee himself admitted:

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[233] For example one subject responded thus: "You've got no choice at all", p.45

[234] 'off the Rails' *Which Magazine*, January , 1999

[235] Public Seminar No. 1: Passengers' Perceptions. Cullen Inquiry, Part 2. 20/09/00. Methodist Central Hall, London.

We certainly would not claim to be capable of producing diamond hard point estimates of the kind that our colleagues in physics and engineering are able to. That said, we do our very best to minimise the extent of bias to try to establish that there is an adequate degree of internal consistency in the responses that we elicit from members of the public. But I think one would have to concede that that is a relatively soft science.

[Jones-Lee 2000]

Included in this approach is the question of what, if any other factors should be added to passengers' revealed willingness to pay, to reflect the wider social and political aspects of the project being considered. Thus he included such factors as the direct economic effects of preventing fatality, including an estimation of the avoided costs to the emergency services. In the case of prevention of a fatality, the avoided loss of the excess of a potential victim's output over and above his/ her consumption was also included.

Related to this is the degree to which these add to the original figure. Jones-Lee didn't regard them as being significant, [236]but here again there was considerable disagreement between experts. Thus the expert called by ASLEF, Dr Ruth Armstrong, pointed out that the Jones-Lee formula failed to take these into account sufficiently and ignored other wider social benefits/costs that publicly subsidised and regulated companies should be subject to. As she stated:

When a Government is directing public funds or regulating decisions of the private sector which have an impact on the wider public it must adopt the broader view. Costs and benefits need to be identified and valued in the appraisal, irrespective of whether the direct area of investment.

This is the so-called 'social cost benefit' analysis, as opposed to the 'commercial benefit analysis', which concentrates on the immediate issues concerning individual companies, (see below, with the Thames Train study). Whilst nearly all studies have recognised the necessity for such valuations[237], few have incorporated them into their analysis. Such additional complexities involved made it almost impossible to arrive at any settled figure. As she said:

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[236] Thus the 1993 figures were Overall value for preventing a fatality was £660,000; Emergency Services; £4350; Avoided lost output £46,000; Avoided Resource Costs £47,000; WTP £617,000. Loomes & Jones –Lee 1994.

[237] Beck for instance excluded them from his analysis.

I think it is difficult to the point of being almost impossible. There are so many different estimates that one comes across in the literature.... Since the presentation of the BR 1994 report, discussion has gone backwards and forwards about the appropriate costs per fatality avoided to be used in such analysis, ranging from the insultingly low £70,000 suggested by the Franchise Director to £3 to 4 million which the HSE thought justifiable. [238]

[Armstrong 2000]

This despite the fact that all the experts involved used the same methodological approach of including a VoL estimation.

The third issue is the one of discounting human life as the safety project proceeds. Discounting involves taking account that over the period through which a safety project is introduced and operated, the associated VoL – and therefore money values of safety - will grow through time as people become better off. Such calculations will have significant implications for assessing the benefits of particular measures. Again, any definitive figure is impossible and it is up to individual analysts to justify their assumptions and calculations and Baram sees this part of the process as being particularly prone to abuse. [239]

The Southall inquiry and the three inquiries arising from the Ladbroke Grove crash exposed the disagreement on this among the experts called by the various parties. Thus arguments were advanced for the public sector rate of 8% as used by BR/ Railtrack, 3% by Beck, 1% by Jones-Lee and no discounting at all by Armstrong and Spackman[240]. The effect of lower discounting of fatalities being to reduce the costs of saving life and thus theoretically at least making any safety measure such as ATP more attractive. Thus Jones-Lee arguing for 1% discount on fatalities in relation to ATP,

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[238] The original BR/ Railtrack figure being £2m, see above. See also Beck's work (2000) on averaging out various WTP studies which came up with £3.3m VoL.

[239] Baram, 1980, p. 489.

[240] Professor Beck, Glasgow Caledonian University, Michael Spackman, special advisor to National Economic Research Associates, and formerly with the Department of Energy and the Treasury.

estimated that the cost of saving a life would fall from the BR/Railtrack figure of £14m, (see above), to £9m. Justifying the figure he said:

> It is what is referred to in the Treasury Green Book as the pure utility discount rate. A discount rate that reflects, for example, uncertainty about the existence of future generations, or uncertainty about the issue of whether technological progress will render what looked like gains at present actually quite worthless.
>
> [Jones- Lee 2000]

Interestingly enough his evidence also threw light on an internal BR calculation that posited the VoL if they ignored the 1994 standard public sector discounted rate, and used the 1997 Treasury Green Book rate. Thus:

> In the document that I have access to, there is one calculation of cost per fatality prevented, were ATP to be installed, in which neither fatalities nor costs are discounted. There is another calculation in which both fatalities and costs are discounted because, as I understand it, the time pattern of costs incurred in installation of ATP bias those costs towards the beginning. The net impact of the discounting both costs and benefits was to, I think, reduce the cost per fatality prevented somewhat.

Additionally, one of the experts, Professor Beck whose report was commissioned by the Passenger Groups pointed to the omission of wider considerations, such as the impact a fatality has on his/her family, or relations, as well as the wider societal issues[241]. The variety of views on the issue was such that the Uff/ Cullen joint inquiry was forced to offer no opinion whatsoever on what would be an appropriate discount rate. Thus: "The discount rates used are, in some cases, contentious. We do not feel it necessary to express any views on this subject."[242] In effect saying: "you pay's your money, you take's your choice."

The degree to which CBA exercises are subjective and based on individual assumptions can be illustrated by referring to two exercises, one commissioned by Thames trains, the other by Professor Beck, on behalf of passenger groups to the inquiry. Discussion on these will form the final section of the chapter.

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[241] Evidence to Part 1 Inquiry, September 20th 2000.

[242] Uff/Cullen Joint Inquiry, para 4.29, p. 45.

Cost Benefit analysis in Action: The Rejection of ATP, Part 2.

The Chapter so far has discussed the general principles of CBA and its application in the rail industry; the final sections will briefly outline two such exercises that have been carried out in assessing the utility of introducing ATP technology. It will be shown that far from being an objective, 'scientific' exercises, both are founded on assumptions, some highly contentious, made by the consultants who under took them.[243] The first is a study commissioned by Thames Trains limited, which found that the installation of ATP on their operations was cost ineffective. The second was sponsored by solicitors representing the bereaved and injured of Southall and Ladbroke Grove.

The Thames Trains Assessment of ATP: the Commercial approach to CBA

> the current guidance (on CBA) provided through Railtrack's yellow book is that you restrict yourself to safety loss only. Which means no rolling stock damage, no infrastructure damage, no revenue loss included at all.
>
> [Cope 2000]

> It (the Cope report) was one of the shoddiest examples of CBA I've ever seen.
>
> [Member of Passenger Group, Public Seminar, No.1: 2000]

Following the Southall accident in 1997, Thames trains commissioned a report on the cost benefit implications of installing ATP equipment on their trains. This was undertaken by John Cope, of consultants, WS Atkins, who had a wide degree of experience in the industry. This was primarily a commercial CBA exercise where he was asked to concentrate up on the

[243] Indeed reviewing the CBA studies submitted by the parties, Spackman concluded that none of them were full CBA "in the sense that the term is applied in academic or government debate."

commercial and financial implications for Thames Trains Limited of installing ATP on its trains and on the infrastructure on which their trains operated. [244]

This found that there was no case for ATP to be installed on either trains, or track. As he concluded:

> It is not possible to make a case in cost benefit terms for installing ATP on sections of route over which Thames Trains operate and for equipping Trains.
>
> [Cope 1998: 170]

A year later a Thames Train going through a red light crashes into a GWT High Speed Train at Ladbroke Grove, killing 31 people and injuring nearly 2,000 - an accident that ATP would have prevented.

In the subsequent Inquiries the study's intention and methodology were examined; revealing the degree to which it was built on contentious assumptions[245]. The main areas of controversy surrounded the elements of distribution and attribution of costs of ATP installation; loss control; estimations of casualty rates; the future trends of SPADs and passenger loads.

Distribution of costs

One of the most obvious objections to the Atkins' report was the decision to include in the analysis both the costs of fitting ATP on to the Thames fleet *and* to the infrastructure on which they ran. This assumed that Thames were responsible for all ATP installation costs - even though as the provider these should have been borne by Railtrack alone, or possibly be

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[244] Although the wording of the brief was somewhat obtuse, thus: "either justification for not fitting ATP to our fleet or financial case for doing so." This phrasing led to considerable debate as to whether Thames Trains were hoping for a report that would justify rejection of ATP as opposed to an objective appraisal.

[245] NB. It is not the intention of the author to apportion blame, or impute motives to either Mr. Cope, or Thames Trains, but merely to illustrate the degree to which the issues of expert assumptions can be influential in what has been claimed to be an objective method of assessing risks.

distributed among other train operators using the same track.[246] As this constituted nearly two-thirds of the total cost, it inflated the ATP related costs for Thames Trains. He even included costing for infrastructure fitment on tracks that had already been fitted with ATP in the early 1990s[247]. Cope had no clear response as to why industry wide costs should be attributed to one company – especially since the potential industry wide benefits were neither calculated, nor attributed to Thames Trains. As the following exchange at the inquiry revealed:

Owen[248]: *Since the benefits of ATP are proportional to the number of SPADs, does it not mean that three-quarters of Thames Trains' SPADs would be saved by fitting the cabs alone since that section of track had already been fitted?*

Cope: *Yes, yes, you could infer that. But you would also have to incur 100% of the cost.*

As Smail commented:

> "Normally in any CBA, you would expect the costs incurred by the company to match the benefits incurred, but not to incur other people's costs, unless they take into account other people's benefits."
>
> [Smail 2000]

Commenting on this Fletcher-Wood[249] made the general observation that one of the difficulties in a fragmented industry with myriad interfaces such as the railways was that:

> If only one party is carrying out a CBA, is the decision as to what it is proper and is improper to include as both a cost and a benefit.

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[246] If borne by Railtrack, then they would seek to recover it from the TOCs that used the relevant track.

[247] Evidence to the Part 1 inquiry 6/07/00. Also see below.

[248] Legal Representative for the Inquiries.

[249] Legal Representative for Great Western Trains at the Inquiries.6/07/00

Another issue revolved around the actual costs of ATP fitment, where not only were Cope's figures were inflated beyond both BR/Railtrack's figures, but even beyond those of Thames Trains themselves. Thus his figure for trackside installation was 300% higher, even though these were costed only 4 years before. In terms of installing ATP on the trains, he came up with a figure nearly twice Thames Trains own estimate.

The second area of controversy involved assumptions concerning the sensitivities to changes in the factors in the report. Such sensitivities essentially act as health checks in assessing whether an exercise is being conducted as thoroughly as it should be. Cope defended the lack of explicit discussion on this by stating that "we had a pretty good idea of the sensitivity of the model" they had devised. This was to prove a highly contentious with other experts testing the model, with different values on the sensitivities giving differing results. These were grouped into the following categories: loss control; Causality rates; Passenger loading; trends in SPADs; costs to other parties in the industry.

Loss control[250]

Loss control is a calculation of the losses avoided because an accident was prevented. The loss control was one concentrated on the company, as opposed to wider social costs that social CBA exercises would include, (see above). Here elements include all the damage incurred except those concerning passengers, for example damage to the rolling stock. Over a 20 year period, he estimated that costs associated with ATP preventable accidents would total £900,000. (The costs incurred through disruption to services etc., were classified as revenue losses). The major assumption made here was to limit costs avoided to those that Thames Trains were directly liable for in their insurance policy. There was complete disregard for any

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[250] Some experts have argued that loss control factors are not necessary in CBA. Cope justified its inclusion because the privatisation of the industry necessarily introduced extra elements of insurance liabilities between the operators. Thus loss control became a relevant issue. Cope 2000.

other losses avoided. Thus in the event of an accident of any severity, Thames Trains would be liable for the £50,000 of damages – the balance being paid by their insurers. Given that their own estimates of potential damage to rolling stock ranged from £70,000 to £1m this could represent a significant under estimation of the total costs avoided for any one accident.[251]. Something that again would have underestimated the benefits associated with ATP installation.

This underestimation was compounded by Cope's further assumption that a multiplier shouldn't be used in assessing uninsured costs. This was contrary to the general practice in industry as advocated by the HSE. Thus a HSE study calculated that any uninsured costs should be factored in to the overall cost of accidents at £8-36, for every £1 of costs insured, according to the severity of the accident. [252]As Smail commented: "My experience is the larger the accident, the more catastrophic, then the higher the multiplier actually is." An example of the implications of such an analysis was the calculation that the Southall and Ladbroke Grove crashes had cost Railtrack, HSE, Great Western Trains, and the BTP £114m alone.[253]

Accidents and Casualties avoided

If Cope's costings were contentious the benefits in terms of accidents and casualties avoided were similarly controversial. In common with most of CBA exercises into railways, Cope used historical data to predict future trends in accidents and the consequent casualties.

In predicting accident trends, Cope concentrated upon the usual method of assessing past accidents - using Evans' analysis – and as predictors of accidents, SPADs. Here though this was an example of the client dictating

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[251] Even though Thames themselves knew that one incident at Slough in 1997 had cost them £900,000, Evidence to inquiry, 6/7/00. See also, Cope, 13/09/00; Smail, 13/09/00; Spackman and also Armstrong 21/09/00.

[252] *The Cost of Accidents,* HSE 1993. HMSO

[253] Evidence from John Hendy, legal representative for the Passenger Groups.

the remit of a study by stressing that Cope deal with only one route instead of all routes over which the Thames Trains' fleet operated.[254] This effectively excluded many sections of infrastructure and 109 SPADs in the relevant period was almost halved to 69, with an annual average of 16.9 SPADs. Cope then reduced the numbers by concentrating on accidents from SPADs that ATP could have prevented and those that occurred over routes that where already ATP was fitted. Even though he still included these routes in when costing ATP fitment, (see above). All these refinements reduced the average from a global figure on all Themes routes in the period of 27 to 7.9, a significant reduction on which to build future predictions.

A *second area involved the estimation of casualty rates where here again the* experts representing various parties disagreed about both the overall trends and the assumptions made about casualties on Thames Trains. If the casualty rates were deemed to be high, then again the benefits of ATP fitment would be proportionately higher. Here the experts also disagreed as to whether Cope's assumptions were valid or not; being based on past accidents and on estimated average passenger loads per train. Smail, reporting for the Inquiry team was particularly critical of these estimates and the lack of any experimentation with the figures and models. The principle issue being that there was no factoring into the calculations of a catastrophic accident involving multiple deaths. On the other hand, Smail's attempts to increase the casualty rates and passenger loads led to some incongruous results such as trains being 125% full.[255] Smail's explanation was that she was concerned not with confirming or otherwise of ATP cost effectiveness, but in testing the sensitivity of Cope's methodology. If the Atkins report was an example of a client's remit and an expert's assumptions driving a CBA exercise, the next example shows how a more fundamentally different approach can also impact on the methodology.

The Beck Report

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[254] Paddington to Oxford.

[255] Although on reflection perhaps not such an outrageous proposition

Professor Beck wasn't called as part of the investigation into either the Southall, or Ladbroke Grove crashes. His involvement was as part of the Joint Inquiry, whose primary task was to compare and contrast the cost effectiveness of two technological systems, TPWS and ATP. Comparison of the two systems has always been at the forefront of the debate over the introduction of ATP that has gone on since the late 1980s; even when TPWS hasn't been mentioned in reports. For more detail on the rival systems (see Appendix 4). In this solicitors representing a pressure group Safety on Trains Action Group, or STAG commissioned him. Maureen Kavanagh whose son Peter *was killed in the Southall train crash in 1997 and Carol* Bell *(a survivor* of Southall) founded STAG and is committed to campaigning for a safe railway in Britain. They see the introduction of the latest version of (ATP) that is EU compliant as an integral part. As such they take an absolute view of safety rather than the cost-benefit trade off taken by industry operators and regulators. As they state:

> No monetary value can be put on the grief and anguish that a serious rail crash causes.
>
> [STAG website 2001]

The point of Professor Beck's alternative approach to CBA was to apply the analysis to particular types of simulated "future" accidents, on which the probability could be calculated, including catastrophic events.' In this he based his study on Cope's exercise on Thames Trains.

The crucial difference between Beck's approach and any others was his criticisms of the averaging out of accident data on annual basis, as for example Professor Evans does (see above) in predicting future trends. His specific reservation was that such an approach wouldn't be able to identify the possibility of an accident involving multiple fatalities. This led him to adopt a probability approach, the Monte Carlo approach, which provides approximate solutions to a variety of mathematical problems by performing statistical sampling experiments on a computer[256]. In the case of railways this was

[256] The method is called after the city in the Monaco principality, because of roulette, a simple random number generator.

based on feeding in accident data randomly into his statistical model to create a distribution pattern, assessing the probability of a multiple fatality accident occurring over a 30 year period. As he stated:

> We can have a random series of accidents, but these would not tell us what the likelihood of a catastrophe is. If we use the underlying distribution then we could use that information to predict the likely incident of a catastrophe occurring over a number of years... the strength of the methodology is that we are not averaging but are taking the heterogeneity of accidents into account in our equations.
>
> [Beck 2000]

The next stage was to assess benefits and costs and then subjecting them to the computer model. This was done on two base models with the assumptions of a VoL of £3.3m and a 3% discounted rate as the best case scenario, and a VoL of £1m and 8% discount. His established costs and benefits were then run through the statistical package with 1,000 scenarios. The results were to make ATP installation a net benefit in the worst case model 134 times out of 1,000. But the best case model saw it a net benefit on 58% of the scenarios. As he concluded:

> It appears clear the cost benefit appraisal of ATP does not, as previously thought, provide an unambiguous negative valuation. On the contrary, on the basis of what we believe to be the most valid set of assumptions, cost benefit appraisal suggests ATP should be installed.

As with all the other studies, Beck's analysis was subject to scrutiny and his assumptions were criticised etc. but the Uff/Cullen Inquiry stressed the difference in approach and assumptions from industry based studies thus:

> This alternative approach Such calculations form an equally valid part of statistical analysis and provide some information, at least, on the likelihood of multi-fatality accidents occurring in the future.
>
> [Cullen 2001]

As Jackson[257] remarked:

[257] Chris Jackson, Legal Representative to the Inquiries 22/09/00.

There are different and overlapping methods and they have different advantages and disadvantages and one selects the right one according to what one is trying to achieve.

[Jackson 2000]

Chapters 4 and 5 have discussed the use of the scientific or rational perspective of risk as applied to the rail industry. This has been done by concentrating on the use of QRA and its role in determining one of the most controversial decisions concerning safety technology in the 1990s. In this a number of failings have been identified both conceptually and practically. Of particular relevance has been the degree to which a seemingly objective method has been in fact highly subjective in its application and interpretation by the various interested parties.

However this is only aspect of the relative failings of the scientific approach; one which assumes that such judgements take place in 'closed systems' where decisions on safety take place in the context of safety cases that are largely uninfluenced by outside factors. Such insulation has never been the case in the rail industry and even when it was a public monopoly there were myriad interfaces. The privatisation process ensured that such an 'open system' would be exacerbated as the number of regulators and operators proliferated. Such implications for safety are the subject of the next chapter.

Chapter 6: Safety in the Open system

> Managing safety on the railway is about managing a whole set of complex interrelationships, because on the one hand you have got growth, you have got the requirements for better train performance and you have got safety, and they are all in conflict and they all need to be held in balance. Since privatisation and fragmentation, it has, I believe, become harder to manage that balance, because the accountabilities are more diffused amongst the different companies and because the powers have been separated as well.
>
> [Corbett 2000:q41]

> It isn't a complexity that arises from mixing and matching a broad collection of skills...BR has a vast 'invisible' workforce that possesses little worker autonomy, despite the traditional worker pride associate with certain jobs.....rather the complexity arises from the enormous degree of interdependence that is inherent in planning and operating the railways.
>
> [Carter 1992: 139]

> The degree of statutory control shall be the minimum consistent with the need to ensure adequate and cost effective levels of control...and to secure public confidence.
>
> [Bacon 2000]

> the present regulatory approach does not appear to offer sufficient assurance to the public, because the commercialised rail industry is also subject to pressures from the economic regulator and from shareholders.
>
> [HSE 2000]

The adoption and extension of the use of quantitative risk assessment techniques in forming government decisions was the subject of Chapter 2 where this was related to the diffusion of decision making generally. This was followed in Chapters 4 and 5 with discussion on its' specific applications to the rail industry and the problems associated with. However, this wasn't the only aspect of the new safety regime, and as the industry fragmented, (see Chapter 3), safety became an increasingly complex issue; both in terms of the number of interfaces involved, and the way responsibility and accountability for safety became increasingly diffuse. This was recognised at the time as being a potential problem especially as new companies unfamiliar with operating on the rail network entered the industry, (Cullen 1990). This gave rise to the notion of the pyramid, or cascade of safety and the safety case regime.

This chapter and Chapter 7 will outline and analyse such developments, by discussing the establishment of new relationships and responsibilities for safety in the privatised industry and by examining the roles and responsibilities of the regulatory bodies concerned with ensuring safety on the railways.

Following on from this, there will be an examination of the Safety Case approach, which lies at the heart of the new system and its use of risk management techniques to deliver. As part of this discussion, there will be examination of the utility of adopting a QRA methodology to the technical and operational standards that underscore the delivery of safety in the industry. Examining the role of Railway Group Standards, RGSs, and the safety case regime and the so-called cascade of safety in the industry will do this. Regardless of the integrity and diligence with which individual RSC holders observe such conditions, it should not be forgotten that they operate in an open system as described in Chapter 5. As apart of this, there will be an examination of how Railtrack's position as the initial acceptor and assessor of Railway Safety Cases.

This leads to the need to discuss issues such as how the regulatory regime impinges on rail operators and how the degree to which the openness of the system has the potential to compromise these arrangements. Thus Chapter 7 will examine the role of the discussing the role of the safety and economic regulators in affecting attitudes to safety along with the existence of literally thousands of organisations that aren't required to hold a Safety case, but nonetheless work along side safety case holders as part of the industry. However this chapter will begin by giving an overview of the new arrangements for delivering safety.

Safety on the Railways: The Pyramid of Safety

In the run up to the 1993 Act, discussions on the implications of privatisation on rail safety were held and there was a recognition that problems may arise regarding safety as profit making organisations entered the industry. As the Health and Safety Executive chairman, Sir John Cullen, remarked in 1993:

> Companies with little or no previous experience of operating on the railways, and managers with limited experience of railway safety issues, will enter the railway industry.
>
> [Smithers, R 1993]

Additionally, the degree of fragmentation of the industry caused by privatisation, (see Chapter 3), was thought to be problematic. As Rayner stated at the time:

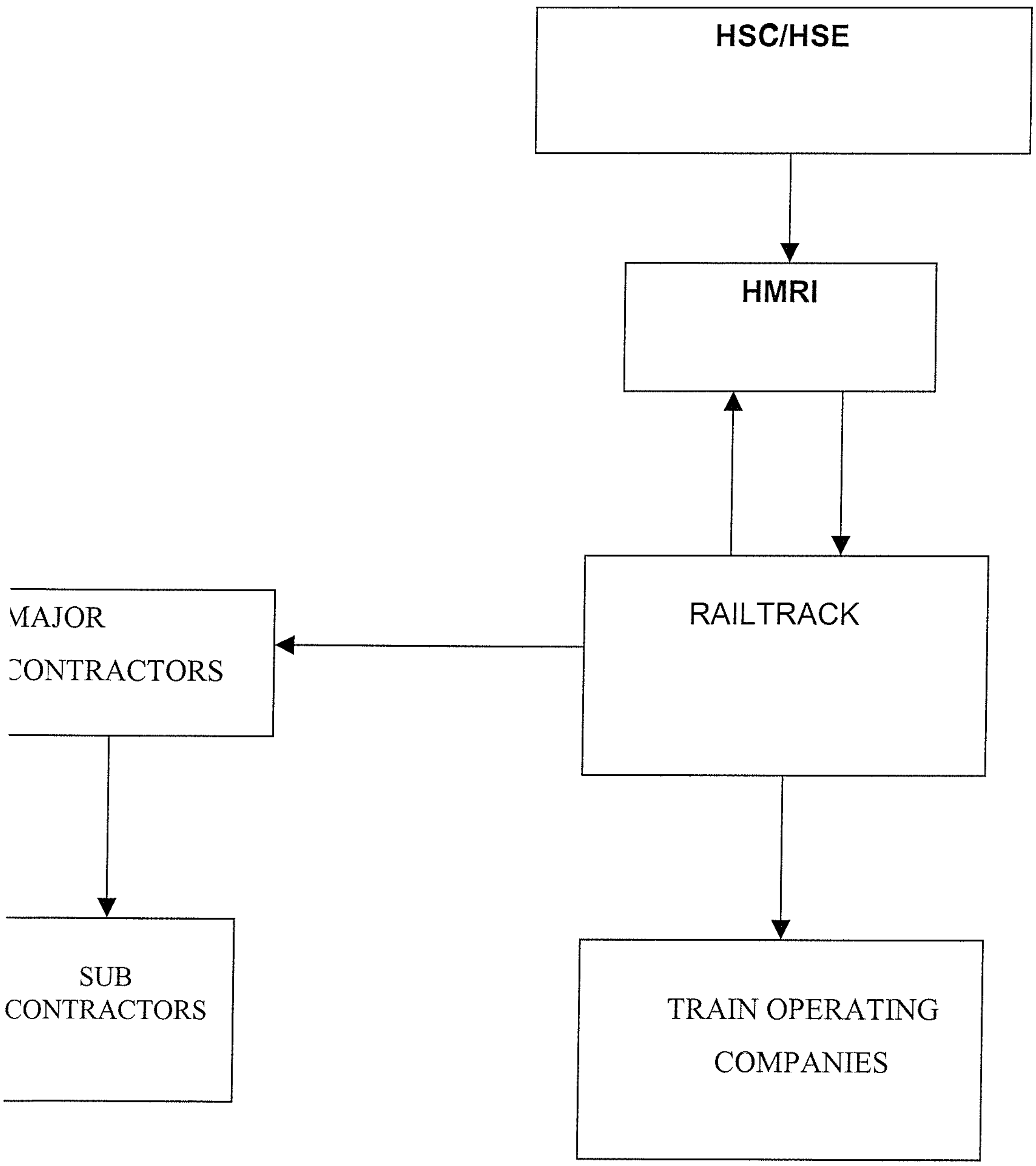
> Our position on (privatisation) is that wherever there is fragmentation of an organisation and the number of interfaces increase, then there are likely to be increased risks in an operation.
>
> [Rayner 1993: q1823]

The Health and Safety Executive also recognised the potential for problems:

> The greater the number of participants, the more the system becomes complex and the more the arrangements needed for managing safety.
>
> [Bacon 1993: q1511]

To reflect the reality of a newly fragmented industry, (see Chapter 3), the unitary responsibility for safety that had existed under British Rail was replaced by a division of responsibilities among the newly formed organisations. This took the form of a 'pyramid' of three tiers of responsibility.

Figure 6: The Pyramid of Safety 1993-2000



The Health and Safety Commission/ Executive

Thus at its apex are the Health and Safety Commission, (HSC) and Executive, (HSE). The Railways Act 1993 brought the framework and the detail of safety provision under the auspices of the 1974 Health and Safety at Work Act, (HSAWA). Under the act the Health and Safety Commission (HSC), is the principal advisor to government ministers on safety issues, whilst its operational, arm the Health and Safety Executive, (HSE), implements and monitors policy. Additionally, all legislation concerning railway safety is made under (HSAWA). As Coleman stated:

> The role of the HSE is....setting and promulgating acceptable safety standards and acting to ensure that parties are doing what they should be doing. We believe that nobody should start operating on the railway unless it can demonstrate it has properly considered the risk.
>
> [Coleman 1993: q 1515]

HMRI

The HSE regulates safety on the railways through the HM Railway Inspectorate (HMRI) which has been an integral part of HSE since 1990. However, its position in the rail industry dates back to the Regulation of Railways Act 1840, and its duties have been extended and refined in successive Acts since. Its regulatory role is comprised of securing compliance with health and safety legislation through considering, accepting as appropriate and monitoring compliance with Railway Safety Cases, (see below). This is done through inspections and if necessary through issuing enforcement notices and prosecutions under the HSAW act. Connected with this they also monitor accident trends and investigate selected incidents. However, it remains the case that any recommendations made by the HMRI aren't mandatory.

It also considers, inspects and (if appropriate) approves proposals for any works, plant or equipment which may affect the safe operation of the system. This includes the rail infrastructure; signalling; rail vehicles and equipment as well as issues such as proposals for modernising level crossings. Major works, such as new railways, are usually inspected before final approval is given. Framing the Railway Safety Principles and Guidance, which sets out the standards required and advice to operators as to how these can be achieved, does this. The management of safety on the railways is governed by the Railways (Safety Case) Regulations 1994, and latterly, 2000.[258]

Railtrack

The second tier of the pyramid is Railtrack, who are the infrastructure provider and maintainer. Because of this, their role in delivering safety is pivotal, as they are responsible for managing risks, which could affect the rail network as a whole.[259] The network licence held by Railtrack, issued by the Secretary of State and enforced by the Rail Regulator includes a requirement to comply with Railway Group Standards. As such it provides the focal point for monitoring risk across the industry and sets performance based safety targets and sets down the criteria for making decisions on safety.

They have to satisfy the HSE as to their competence to run a railway safely, but also are responsible for validating the safety arrangements the TOCs and for recommending them to the HSE, (see below).

The over seeing of this process was assigned to the Safety and Standards Directorate, (SSD) of Railtrack, which was a separate company within the Railtrack Group and was in reality the old British Rail safety directorate which had been transferred en bloc to Railtrack, including the staff[260]. The new structure included a safety director at board level, with subsidiary boards created separately from safety concerns.

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[258] Information from the HMRI website.

[259] This role was established by the 1993 Act and the adoption of the recommendations of the 1993 HSE publication, '*Ensuring Safety on Britain's Railways*,' under the provisions of Part 1 of the 1974 HSAW Act

[260] "Only the stationary had changed." Maidment interview 1999.

The S&SD was succeeded in 2000 by a new organisation, called 'Railtrack Safety' which whilst still in the Railtrack group represented an attempt to further separate Railtrack's responsibilities for safety from its commercial operations.

Train Operating Companies and Rolling Stock Companies, (ROSCOs) and Infrastructure Contractors

These represent the base of the pyramid and are required to satisfy both Railtrack and the HSE/HMRI that they are competent to operate, or supply the rail network. How they do this will be discussed throughout the chapter. It is sufficient at this stage to say that this is done primarily via the Railway Safety Case, (RSC), although it should be recognised that not all organisations working on the railway are required to have a safety case. Thus whilst the 26 Train Operating Companies, (TOCs) have to have a RSC, only the major infrastructure contracting companies need one and any small, or sub contractors are usually exempt. The same is the case with the companies who supply rolling stock for the network, the ROSCOs.

Other Regulatory Bodies

In addition to this 'cascade' of safety structure, there are other regulatory bodies to be mentioned when considering aspects of rail safety. These include the Office of the Rail Regulator, ORR, and the Office of Rail Passenger Franchising, OPRAF, which since 2001 has been replaced by the Strategic Rail Authority. These bodies whilst primarily concerned with the financial and economic regulation of the railways, (see Chapter 3), nonetheless have an input into safety issues Thus one of the ORR must:

> "Take into account the need to protect all persons from dangers arising from the operation of railways, in particular, taking account of any advice given him in that behalf by the Health and Safety Executive and to have regard to the effect on the environment of activities connected with the provision of railway services."
>
> [ORR website 2001]

To achieve this a so-called 'Memorandum of Understanding' exists between the Rail Regulator and the HSE as the safety regulators. Part of this involves the stipulation that operators of stations, trains and networks must normally have an accepted Railway Safety Case before the ORR will grant a licence for operation.

However, the chief debate over the role of these organisations is whether the economic and financial pressures placed on TOCs and Railtrack have affected the attitudes towards safety in the industry. This will be discussed in Chapter 7 when safety culture is considered. This chapter will concentrate on the role and performance of Railtrack.

S&SD/ Railtrack Safety and Railway Safety[261]

Through S&SD and latterly Railtrack Safety and Railway Safety, the Railtrack group of companies have been responsible for two major components of safety delivery: the establishment and promulgation of Railway Group safety standards and the validation of the Railway Safety Cases of operators in the industry. This includes 'Rail line' Railtrack's operational arm, the Train Operating Companies, (TOCs), and major contractors. The primacy of Railtrack in accepting and recommending safety cases as established by the 1993 Act and subsequent 1994 Railway Safety Case regulations was modified and diluted by the revising 2000 Safety Case Regulations, but not substantially so. Thus the regulations state:

> "The infrastructure controller shall scrutinise the safety case submitted to him and shall then send it to the Executive, (HSE).... (a) where it has been modified, et cetera: "(b) the recommendations of the infrastructure controller as to whether the safety case should or should not be accepted, and if the recommendation is that it should not be accepted the reasons for that recommendation."

[HSE 2000][262]

The maintenance of Railtrack Safety's position was brought out in the following exchange between Robert Owen, QC, and Counsel to the Part 2

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[261] It should be noted that although the title of the company has changed over the years these apparently separate organisations are essentially the same, with the same personnel and structure.

[262] This was characterised at the Part 2 inquiry as Railtrack "being still very much in control of the ship." Waite, 2000.

Cullen Inquiry and Roderick Muttram, Chief Executive of Railtrack Safety (later re-launched as Railway Safety). Thus:

Owen: the point I am making is that there the infrastructure controller is still very much in control of the ship, if I can put it that way?

Muttram: He would certainly, as I read it, have a major influence on the HSE's decision. But the HSE does not have to follow that.

Owen: But he makes the recommendation?

Muttram: Yes.

The difference being that there is more scope for the HMRI to examine risk associated with activities not directly concerned with the operation of the infrastructure.

Having outlined the structure for delivering safety on the rail network, the following sections will examine how this is actually delivered. To do this there will an assessment of how operators are judged as to whether they are competent to operate safely. This is done by assessing their compliance with Railway Standards and by the quality of their safety case.

Railway Group Standards (RGSs)

It is the role of Railway Group Standards to provide a safety framework, which permits and facilitates the exchange of permissible tolerances between the different Railway Group members but still retains a safe system.

[Muttram 2001: 45]

Every railway group standard was there to control a specific risk, or group of risks. Compliance with the standard was intended to control that risk to an acceptable level.

[Siebert 1999][263]

Nobody had given any thought to the fact that a train could within the rules be driven without AWS at 125 m.p.h., with a full load of passengers and nothing to cater for the risk of a driver not keeping a proper lookout.

[Mr. Justice Scott Baker 1999][264]

[263] Michael Siebert, Railtrack Auditor, GWT Trains, June 1995- 1998.

[264] From the transcript of the Criminal Prosecution, R v GWT, 26/07/99.

As already mentioned in Chapter 4, the Railway Group Standards are technical and operational standards that are mandatory to all train operators and infrastructure companies. The notion of group safety standards was one of the inheritances from the old British Rail Rule Book, which outlined how front line staff such as drivers and signallers were required to do their job. Rod Muttram underscored the importance of RGSs[265] in his evidence to the Part 2 Inquiry:

> It is through the group standards that Railtrack is able to ensure that those having access to the infrastructure should operate safely. If there were no group standards procedure it would be extremely difficult for Railtrack to discharge its obligations as duty holder in respect of the railway infrastructure.
>
> [Muttram 2000a: 87]

Similarly, the HMRI in their 1996/97 report reiterated the importance of standards as the focus of rail safety in three distinct areas: technical (including the standard and conditions of rail vehicles, track and signalling); People (personnel and training etc); and Procedural (operating rules systems and auditing).

As Maidment noted in his interview with the author, one of the perceived problems with the prescriptive nature of the Book was that the sheer volume of rules was beginning to overwhelm operators. [266] As part of the more pro-active approach to risk management adapted from the late 1980s, there has been a movement to reduce the number of Rail Standards and to compliment and where possible replace prescriptive standards with ones based on the ALARP principle, (see Chapters 2 and 4). As Muttram emphasised:

> Where possible Railway Group Standards are goal setting and are there to set a framework for safe interworking.
>
> [Muttram 2000: 45]

The creation and implementation of Rail Standards are the primary responsibility of Railway Safety who inherited responsibility from Railtrack S&SD. To this end, Railway Safety publishes an annual Railway Group Safety

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[265] Director, Safety and Standards, Railway Safety, (formerly S&SD, Railtrack)

[266] Maidment October 1999. See also Chapter 6.

Plan, which sets out priorities and targets for risk reduction, for passengers, staff, contractors and the general public. All Rail Safety case holders as part of satisfying their licence must adhere to these, including TOCs and major Infrastructure contractors. However this process should in no way be seen as either authoritarian nor prescriptive, and assessments and standards are only introduced or amended after a process of consultation and negotiation across the industry via a series of committees of representatives from Railtrack, the TOCs, major contractors and experts. The notion being to promote a sense of ownership to encourage compliance. [267] As part of this, any Group member can propose either a new standard or amendments to existing ones. It is interesting though to note that the first test of any such proposal would to check against existing practice in terms of cost effectiveness. Again Muttram:

> 'Railway Safety' checks these (proposals) against the Code's criteria to ensure they provide the necessary safety benefits to justify implementation costs.
>
> [Muttram 2001: 45]

Evans and Horbury were more explicit in their analysis pointing to the crucial role undertaken by CBA and 'tolerability', or the ALARP principle in informing RGSs. Thus:

> On these criteria, safety measures are adopted if either of two conditions is satisfied:
>
> Their benefits exceed their costs, using VPFs
>
> Without them (the standards, certain individuals would be at an individual risk level that exceeds an ' intolerable' limit.
>
> [Evans & Horbury 1999:18]

The reliance on risk assessment based on QRA was seen by Railtrack as enabling them to introduce consistency in the decision making process as regards safety. [268]This maxim is reinforced by the HMRI, who are always consulted on changes to Group standards, and who view them in the light of ALARP.[269] As the HMRI reported in 1998:

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[267] Stevenson, 1996 p.266 and Muttram, 2001, p.46

[268] thus the HMRI safety report 1997/98

[269] Cullen Inquiry Part 2 Report, 2001, para, 6.16, p.82.

> Railtrack quite properly wishes to be seen to be consistent and appropriate in their safety decision making. During the year, HMRI responded to the proposition that such decision making should be based as far as possible on safety-decision rules determined by cost benefit analysis, and supported by QRA.
>
> [HMRI 1998: 105]

Further, once established, TOCs etc are largely left to devise their own procedures and practices that satisfy such requirements, including how they assess associated risks, (see below).[270] Such discretion is mostly confined to operational matters and those activities where it is deemed that one operator's methods don't directly impact on another's. But it is also apparent in technical standards where one would assume that the prescriptive approach would have exclusive sway. Thus in his 2001 article Muttram cited two examples where whilst standards were prescriptive, "there was scope for innovation" and, "The mandatory safety framework must not prevent or act as a block for such innovation." [Muttram, 2001: 45-46].

These concerned the degree to which railway tracks are maintained to achieve tolerances in the track. The second example cited was speed limits between signals. Here whilst the train drivers' rule book covers such issues as braking distance before red lights, and as a consequence there are requirements for speeding between lights, he emphasised that High Speed Trains, whose brakes are suitably adapted, could run at above the stipulated, or standard limit.

The reliance on ALARP when establishing Standards of course raises the same issues covered in Chapters 4 and 5. But secondly, the discretion given to TOCs in achieving or meeting RGSs raises the question as to how Railtrack ensures that RGSs are being adhered to.

The degree to which TOCs are allowed discretion in adhering to RGSs rests on two aspects of safety on the network: the obligation to undertake a risk assessment on the likely consequences of their operations and Railtrack's ability to supervise a TOC's such adherence. The dangers in adopting such an approach were to emerge in the aftermath of the Southall crash, in September 1997, (see Appendix 3)

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[270] See for example Muttram, 1999, evidence to the Uff inquiry and Evans and Horbury, 1999, and evidence to the Cullen Part 2 Inquiry.

RGSs and TOCs: RGS GO/OT0013 and the Southall Crash

Standard GO/OT0013 is the operational procedure to be followed by TOCs when mechanical and electronic safety devices on trains, such as Advanced Warning System or AWS, were defective.

To reiterate, AWS gives the driver an audible and visual reminder of the whether it is safe to pass a signal. If the signal being approached is clear (green) a bell sounds in the cab and the visual reminder is cleared. If the signal is not clear - red, yellow (next signal is red) or double yellow (next signal is yellow) - a hooter or buzzer sounds in the cab and the visual indicator is set to indicate that the last signal passed was not clear. There was much comment both at the 1999 trial and the Uff Inquiry that it was dangerous for drivers to operate a train without backup systems such as AWS. Thus Professor Groeger in his evidence to the Uff Inquiry: "the key point is that without a system, a support system, such as AWS,...errors are likely to occur in a complex situation."[271] Moreover the longer the journey the more likely that errors would start to occur. Again Groeger:

> The anticipation of ending the journey is probably distracting and similarly the fatigue or sheer amount of effort that has been involved in monitoring the system up until that point, comes against and undermines the driver's effectiveness.
>
> [Groeger 1999][272]

In 1993, Standard GO/OT0013 was downgraded from a Category 'A' procedure, where trains would automatically taken out of service, if safety equipment was defective, to a category 'B' procedure where TOCs were allowed to continue to operate a train once in service so long as a risk assessment had been undertaken to balance the relative degrees of risk associated with continuing or ceasing a train's operations.

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[271] Evidence to Uff Inquiry, Day 23, and November1999.

[272] Of course such factors point to the role of human error in accident causation, See for example, Chapter 2 and the work by Reason, etc. See also the evidence offered by CIRAS, Spring Newsletter, 1997, April 1997, or 5 months before the Southall crash.

Thus section H of the rulebook outlined Category A as:

A= you must take the train out of service immediately or as soon as possible.

By contrast, Category B introduced an element of discretion into the procedure.

Thus: *B= you must take the train out of service at the first suitable location, without causing delay or cancellation*[273]

The reasoning behind this down grading was that contrary to most safety experts the personnel at British Rail saw AWS more as a device to guide and assist drivers instead of playing a central role in prevention of Signals Passed at Danger, (SPADs). [274]Allowing such discretion was to have devastating results in the Southall disaster, (see Appendix)[275]. At the subsequent Uff Inquiry, Railtrack admitted that the ambiguity inherent in such a change caused significant confusion as to whether the GWT train, whose AWS system was defective and thus 'isolated', should have entered operation on the fateful day. As their own legal representative concluded:

> It is accepted that the Standard GO/OT0013 was fit to be criticised for lack of clarity and ambiguity as respects the entry, and taking of trains out of, service with defective AWS[276]. Sir it is accepted that the same criticism can be leveled at the rules.....Railtrack accepts that the present position (*as of 1999, two years after the crash*) is still not satisfactory and must be improved.
>
> [Henderson 1999][277]

[273] The Author's emphasis

[274] Thus Mike Harwood's evidence to the Uff Inquiry, Day 23, November, 1999.

[275] It should be noted that in the light of the Southall crash, the HMRI wrote to the TOCs asking for more clarity and consistency on the operation of the RGS on safety equipment, but even then only a few TOCs 'tightened up' their standards.

[276] Advanced Warning System, see Appendix xxx.

[277] The author's italics.

The representative then reassured the Inquiry that such a review of the status of the RGS was 'in hand'. A second ambiguity in the standard concerned when a train was deemed to be in service at all. Again, Great Western Trains were left to interpret whether or not a train was 'in service' at the time of a safety failure for themselves. On the day of the Southall crash, the cabin was already without any working safety equipment *before* the train left the marshalling yard in Swansea. Consequently, Uff concluded that even if GWT management had known about the faulty AWS it would not have prevented them from allowing the train to continue in service. As he concluded:

> However, GWT did not contend that they would have taken either of these actions had the messages been received. There was certainly no record of these steps ever being taken by GWT in such circumstances and the level of AWS failures eventually established that such occurrences were by no means rare... The appropriate conclusion to be drawn is that train 1A47[278] was allowed to run with AWS isolated because this was accepted by GWT, and would have been accepted had they received and considered Driver Tunnock's messages.
>
> [Uff 2000: para 7.9, p. 82]

It took the Southall crash for the HMRI to establish finally what should have been self-evident: that a train without AWS or something similar shouldn't start any journey. As their circular of 30/09/97[279] stated: "A train should not commence a journey without AWS working in the driving cab" [HMRI 1997a]. Such action from the HMRI can only be described as 'shutting the barn door after the horse had bolted.' This assessment is especially damning given that the HMRI had had occasion to warn the industry about the need to stop trains in the event of AWS failure following a train crash in 1995 (2 years before Southall), at Cowden in Kent, and at Derby North in 1998.[280] Of course as the overall regulator of the safety on the rail system they could have upgraded GO/OT0013 to a category A requirement. As Coleman admitted:

> It is fair to say that we were content with that situation.. it was a consensus view in the industry.

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[278] GWT The High Speed Train involved in the accident, see Appendix 3

[279] Nine days after the Southall Crash. HSE Press release E174:97.

[280] See Appendix 3 for details.

[Coleman 1999a]

The issue was only formally addressed by HMRI in the 1999 Amendments to the 1994 Safety Regulations.[281] However, it also emerged that not only was it standard practice for GWT to continue running trains with defective safety devices but that this decision had been taken without being informed by any risk assessment as required in order to adhere to RGS. Instead they had looked at the wording of Standard GO/OT0013 and interpreted it to fit their requirements.[282] The degree to which individual TOCs interpreted this rule was illustrated in evidence submitted to the Southall Inquiry by the HMRI. This concluded that TOCs such as Scotrail and Virgin either trains instructed that trains should reduce speed when approaching the next station, where the train could be taken out of service, or that there should be a second driver in the cab.[283] GWT did neither.

This lack of any formal quantitative assessment was of course down to GWT as the operator, but ultimately Railtrack shared part of the blame as the inheritor of the British Rail rulebook. Again, this arose because the safety division of BR regarded AWS as a 'secondary device' and only an aid rather than a necessity.[284] In this respect it should also be remembered that the S&SD division of Railtrack 1993-1996 comprised the same personnel as the old BR Safety division.[285]

When GWT did undertake such a QRA exercise in June 1998[286] it concluded that in respect of QRA assessments if there had been one carried

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[281] It is probable that this was done to pre-empt the findings of the Southall Inquiry.

[282] Evidence in the Criminal Proceedings, July 1999.

[283] HMRI report "Results of a survey on TOCs: AWS failure Procedures." HMRI 1997/98. It should be said that prior to Southall the HMRI were unaware that TOCs were interpreting the standard in such an individualist way. See Coleman 1999a.

[284] Harwood. Op.Cit No.17

[285] Maidment, 1999, interview with the author and evidence to Cullen, Part 2, 2000.

[286] Nine months after the Southall crash.

out for the more advanced form of train protection, ATP[287], then it was illogical not to have undertaken one for AWS. It should be said though that pre Southall, no organisation involved in delivering safety to the network thought it important to undertake any such exercise in relation to the rule - including the regulator, HMRI. This even though one of their inspectors expressed incredulity that GWT's interpretation could be unsupported by risk assessment.[288] Lord Justice Baker summed up the logical conclusion of all of this at the criminal trial in July 1999 when he stated:

> The conclusion to be drawn from the rule book is that running this train (the GWT 1A47 train) from Swansea to Paddington without the AWS operative, did not present a serious safety risk.
>
> [Lord Justice Scott Baker 1999]

At the time of the trial, some 20 months after the Southall crash, the AWS rule had still not being changed back from Category B to Category A status, again leaving it to TOC discretion as to how to interpret it.[289]

It should be said that GWT weren't alone in not undertaking risk assessments in implementing RGSs. In fact in 2000, the HMRI found that a similarly ambiguous attitude to a standard approach when implementing RGSs. Thus Railtrack Line, the operating and commercial arm of Railtrack, routinely ignored its' own safety case, as written by Railway Safety, (its sister company in the Railtrack Group), in not subjecting the application of technical and operational RGSs to risk assessment. As their report concluded they relied on the

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[287]In this they were referring to the QRA undertaken by British Rail and Railtrack, 1993-1995 see Chapter 6.

[288] Thus Andrew Harvey HMRI Inspector. "AWS was regarded as driver aid – but without any risk assessment" Evidence to Southall Inquiry, Day 3, Southall Inquiry, September 1999.

[289] It should however be stated that the majority of TOCs began to regard the lack of working safety equipment as a Category A failing.

'Professional judgement and experience of Technical and Professional Heads with little reference to formal risk assessment /tools procedures.'

[HMRI 2000: 68]

The Railway Safety Case, (RSC)

The principal purpose, (of a safety case) I believe, is as a tool, a route map, a record of commitments for management to set out how they organize their operation to work safely. It also follows from that and it is sometimes combined with it that it is also a document that the regulators can use to check the company's, the operation's compliance and wider than compliance coverage of all matters that might affect safety. Thirdly, it gives confidence to the regulators, and perhaps through the regulators to the members of public and also to the management of the company that they have adequate controls to manage their operations safely.

[Waite 2000][290]

If the RGSs can be characterised as the universal pre-requisites of what is required of all operators who seek to run a railway system, including the remnants of the old BR rule book, the Railway Safety Case, (RSC), is the way in which those rules are applied to the particular characteristics and circumstances of the individual operator.

As Muttram stated:

"Preparing an RSC is not simply an exercise in writing a document. It usually involves evolving the procedures and arrangements necessary for conducting the railway operation in an acceptable safe manner and designing the organisation for implementing them."

[Muttram 2001:42]

Again these are characterised by degrees of discretion being given to individual operators.

The origins and function of the Safety case and how it came to be adopted has already been outlined in Chapter 3. To reiterate briefly, its adoption was seen as vital for two reasons. One was to establish the importance of safety Management systems as a principle under-pinning the delivery of safety on the system and secondly to guard against the potential problems brought about by fragmentation in the system. Practitioners and academics alike have supported such necessity. Thus Lord Cullen (2001) commenting on the overall evidence presented by expert witnesses to the Part 2 Inquiry concluded:

[290] John Waite, ENTEC, evidence to Cullen Part 2, November, 2000.

The safety case was and is seen as providing, in the disaggregated state of the rail industry, an appropriate means of managing safety on one hand and, on the other hand, providing an adequate assurance of safety for independent scrutiny

[Cullen 2001a para 7.4, p.86]

Cullen saw the delivery of safety as hinging on the presence of a safety case. Thus:

In my view the application of the safety case to Great Britain's railways is an appropriate means of delivering that objective.

[Cullen 2001a, para 7.9, p.87]

RSCs can be regarded as 'enforced self-regulation'[291] where the organisation, or company subject to regulation effectively write their own rules and conditions, which are then regulated by external bodies. Horbury (1996) in her thesis makes the same argument for its utility, citing Perrow's work on accidents in the nuclear and other highly technological industries. Discussion of Perrow's work is discussed in greater depth in Chapter 2, but to reiterate his argument briefly, he argues that in advanced technological processes, it is the system itself and not the human factor that is the crucial pre-condition for most disasters. As technology and technological systems become more complicated, the more likely unforeseen events will impact on each other to cause disasters. The extent to which is the case will be a function of the degree to which systems can be said to be tightly coupled and related in a highly complex way. Or as Evans put it to the Cullen Inquiry:' when things go wrong, they go wrong very quickly'.[292]

Horbury, (1996), looking at the fragmentation of the privatised industry (as outlined in Chapter 3), concluded that the move away from a monolithic authority responsible for provision of rail services, to one of at least 125 companies[293], (or on another more inclusive estimate in excess of 2,000[294]),

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[291] As outlined by Ayres and Braithwaite, (1992), in 'Responsive Legislation' OUP.

[292] Evans, evidence to Cullen, November 22/23 2000.

[293] Estimated by Chris Green, Chief Executive, Virgin Railways in his lecture to the Institute of Logistics and Transport, 13/02/01

created increased complexity in the system, making the necessity of a safety case regime compelling. Thus:

> As a result of the industry becoming more dangerous in terms of tight coupling and increased complexity it is more important for the successful implementation of the safety case.
>
> [Horbury 1996: 102]

According to the 1994 RSC regulations, the function of a RSC is:

- to demonstrate and understanding of the risks that the operation will bring into the rail system and how they will be properly controlled
- understanding of Railway Group standards applicable to their operations
- knowledge of the competencies required of key safety personnel
- organisational support for these key personnel
- That all interfaces between the proposed operation and neighbouring operations have been considered and their management clearly allocated.

. It also accords with Railtrack's insistence that they be regarded as 'living documents'[295] capable of reacting to changing events and technology. Thus for example Railtrack in 1998:

> [It] is a living document evolving as our understanding of the context within which we deliver an acceptably safe railway and our organisation to deliver it develops.
>
> [Railtrack 1998a: 44]

Again the emphasis is on devolution of responsibility to the potential safety case holders to produce and operate their own cases. The construction of a safety case is left to the potential operator and has never been by any means prescriptive. The rationale being similar to consulting on RGSs, that is

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[294] Wheeler, C (2000) verbal evidence to the Cullen Inquiry, October and December, 2000.

[295] Various officials from the HMRI and Railtrack have used the phrase throughout the literature and public inquiries. For instance Coleman, 2000b and Corbett, 2000, Muttram, 2000 etc.

to confer a sense of ownership on them. This has meant that whilst they contain overall generic concepts, such as description of operations and the system of management in place to deliver it, no one RSC is the same and Evans' analysis of 22 such RSCs reveals such diversity. This in itself is sensible given that different organisations perform different functions on the system. However, the downside of this is that the quality of the content and areas covered by individual safety cases is variable. Evidence to the various Cullen inquiries revealed this.

Thus Evans found that not one of the cases studied complied completely with the overall expected content and that a third of the safety cases omitted at least one element that was considered crucial to running a safe operation.[296] Other witnesses pointed to the variability of safety cases and how their holders regarded them. Thus a specially commissioned report for the inquiry undertaken by ENTEC, a firm of safety consultants found that whilst safety cases listed the arrangements for delivering safety, they were vague on the detail. This left the consultant, P J Waite, to conclude that they were designed to reassure auditors that something was being done rather than demonstrating it or providing auditors with a methodology of examining them. [297] In this Waite hasn't been the only one to criticise TOCs for being complacent in regarding acceptance and holding a safety case as being sufficient evidence of a safe railway. Thus the HSE and HMRI made constant references for the need for more to be done over and above having a safety case accepted. In 1997 the Chief Inspector of HMRI voiced the concern that TOC managers thought that:

> once a safety case has been accepted they need make no changes anywhere to their arrangements to improve safety. There will always be room for improvement 'on the ground' using procedures and principles set out in the safety case.
>
> [HMRI 1997]

The Chief Executive of HSE amplified the point before the Transport Select Committee a year later when she said:

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[296] Evidence to Cullen Inquiry, November 22nd 2000.

[297] ENTEC Report for the Cullen Inquiry Secretariat. November 2000.

The area of uncertainty is the one where going the extra mile erring on the side of safety is the most important.

[Bacon 1998: Q236]

By 2000 this situation had not changed and the Deputy Chief Inspector of HMRI, Michael Brown, opined that:

Unfortunately, too many of the safety cases represent a wish list, rather than describing what the company actually dose in practice.[298]

Further he criticised his own organisation's regulations for not being explicit enough in its' preference for ALARP being applied to risk decisions constructively.

In this sense, the notion of Safety Cases as 'living documents' able to react to changing circumstances as well as initiating change in operations and procedures rang rather hollow. Major Holden commenting on the early days of safety cases concluded that some examples presented were 'horrible'[299] being written by consultants hired by TOCs, rather than by the staff that would be required to work it. Brown also pointed to his experiences as an HMRI inspector where TOCs concentrated on doing what they thought was expected of them rather than using safety cases as a means of improving safety. [300] As the ENTEC report concluded:

There are examples of where the safety cases have very much been prepared because they have to be under the regulations, rather than using them as an opportunity to derive other benefits that we have mentioned earlier of working documents and being useful to management

[Waite 2000:46]

Also, well written and prepared safety cases doesn't by any means guarantee sound practice. Brown again:

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[298] Evidence to Cullen Inquiry, Part 2. 21/11/00.

[299] Ibid.

[300] Evidence to Cullen Inquiry, Part 2 22/11/00.

Some very good safety cases are not always matched by very good ground performance and there are some good ground performers who actually do not have terribly good safety cases.

[Brown: 2000]

This points to one of the major issues vis a vis safety cases and that is the way they are implemented by individual holders. As with the variability of content, so there is variability in the degree to which managers to promote a culture, or climate of safety within companies use them. Thus Horbury (1996) in her researches into one train operating company found a lack of communication in safety matters between senior and middle management on the one hand and frontline employees on the other. Five years later, Public Seminar 4 which looked at how employees from across the industry perceived safety revealed that there had been little or no attempt to communicate safety issues identified and enunciated in the safety case documents.

Thus from an employee of a leading contractor:

visits from top management are infrequent and "propaganda". Team briefings starts off at board level but information is cut out as briefings go down the chain. There are no safety briefings as such........people are frigthened to raise health and safety issues and be reps because of the fear of sacking and been seen as awkward

From an Electronic Control Operator employed by Railtrack:

senior management visit staff annually or when accompanied by VIPs. Also, there is a lack of expertise in discussing matters with staff. RT has imposed an incompetent management because they are operational managers and have no technical expertise.

From another Contractor, this time a manager:

A briefing isn't useful if communication isn't two way and it needs to be more pro-active. There is a problem of getting staff reps to come along to safety meetings. There's no interest.

From an employee of an engineering company:

Safety days have been reduced and the safety content isn't there.

Train Driver for a TOC:

Safety briefings are non-existent.

The Secretariat of the seminar summed up the issue of communication thus:

Generally the culture of disseminating information is on the decline, particularly across company boundaries..... If a manager does not know these matters then he cannot manage safety properly. Regular contact is needed. It is felt that a lot of managers had lost touch with their staff and failed to communicate properly.

[Public Seminar 4 18/102000]

Where companies held safety briefings, again the standards and contents varied enormously across safety case holders, thus:

The quality and standard of briefings varied. Some companies were very good, some shambolic In other companies safety briefings had been discarded.

Such briefings could be variable and what was scheduled, as safety briefings became pep talks on performance levels:

Where information was circulated it was late, there was little time to read it and it was poorly presented. In another case, team briefings had replaced the traditional safety briefing, and these were used to disseminate information throughout the company. However, when it reached the workforce it appeared to them to concentrate on performance statistics, with little or no chance for feedback. Problems were also noted with shift working, whereby employees missed team briefings, as they were not allowed time off.

Testifying independently. Andrew Brown from the HMRI conceded such variability, describing it as 'patchy.'[301]

Moreover in an industry as complex and interdependent as the rail industry, none of the studies into individual safety cases surveyed could find any reference to how one company's operations could impact on others. This lack of thought about interfaces in the industry is one of the most glaring aspects of the safety case regime.

Given the variety and variability of safety cases a great deal of emphasis was placed on the notion of the cascade of safety to work and for especially HMRI and Railtrack to monitor the quality of safety cases over time and to enforce regulations and procedures. This aspect will be discussed later on the Chapter, but next there will be discussion of one of the fundamental requirements of a RSC, a demonstrable commitment to risk assessments.

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[301] Evidence to Part 2 Inquiry, November 2000.

Here too, it can be seen that there is considerable diversity and paradoxically, given the centrality of ALARP to the HSE/HMRI approach, little of it concerns QRA.

Risk Assessment and TOCs

A cornerstone of the 1994 Safety Case Regulations was the requirement for a potential operator to produce a 'suitable and sufficient' risk assessment[302].

The first thing to note is that despite of the 1994 and 2000 requirements for such a risk assessment, it isn't stipulated that safety case holders should demonstrate in their RSC document that they have a risk assessment procedure in place, or what it entails.

> The Railway Safety case Regulations do not specifically require risk reduction measures to be included in the safety case. The 2000 regulations do not go far enough in that they do not require the duty holder to say how he proposes to reduce the risk to as low as reasonably practical...because of the potential for major hazards and the use of predictive risk assessment within the industry it would be very helpful to refer to ALARP.
>
> [Waite 2000: 74]

The way TOCs assess risk is far from being uniform there are as many different philosophies and forms as there are TOCs, each reflecting the circumstances of the Safety case holders. Evans and Horbury uncovered this in their 1999 survey of the 25 TOCs.[303] Their work examined the safety case documents of 22 out of the 25 TOCs and followed them up with interviews of key personnel involved. One of their principle findings was the QRA approach so favoured by the HSE/HMRI and to a lesser extent, Railway Safety, is far from universally practised. In fact there was no specific reference to QRA in any of the documents, nor was there any formal commitment to base decisions on risk on the ALARP.

This is surprising given that ALARP has been the legal foundation of safety decisions since 1948 and advocated by the HSE since 1988 (see Chapters 2 and 4). As Evans commented:

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[302] 'Railway Safety' A Report by Her Majesty's Chief of Rail Inspectorate on Railway Safety, 1996/1997. HMSO Books, 1997.

[303] Evans, AW & Horbury, AX. (1999)

"The risk assessments within these safety cases were fairly basic and qualitative in nature, with only one or two companies undertaking a full quantified risk assessment of its activities."

[Evans & Horbury 1999 & Evans 2000a]

The preference was for the use of risk matrices, with hazards being identified and assessed in terms of being scored 1-5 both in terms of probability and impact. [304] Once assessed any evaluation seeks to place the hazard in a position relative to others and thereby create a sense of what risks should be prioritised. Such analysis can be undertaken either by quantitative methods such as the application of the ALARP principal or qualitative methods.[305] In the case of the TOCs this was overwhelmingly qualitative reliant on subject judgements by safety personnel or expert consultants. [306] A system criticised by the HMRI thus:

Most operators have adopted a semi-quantified approach based on simple risk matrices; they are a fairly coarse sieve and of little use as day- to day measure of change. Only rarely will any effects arising from a change in the management process be detected by such means.

[HMRI 1997:113]

Even though both Railtrack and HMRI attempted to change this approach, in the late 1990s by for example the establishment of a QRA forum in 1998/99. The argument put forward by the supporters of such diversity is that different TOCs face different conditions under which they operate their services. For example the different rates at which rolling stock is replaced, and consequently its age etc. However, the forum showed that even those risks that could be considered as general to the industry were being perceived and ranked differently across the 26 TOCs. Thus

(there was) a considerable disparity between the operators regarding the values of frequency and consequence each had assigned to risks that are largely common to the whole industry.

[HMRI 1999: 105]

[304] Also known as Failure Modes and Effects Criticality Analysis, (FMECA). Frosdick, 1999.

[305] See for example, Frosdick, 1999, p.29.

[306] Again Evans & Horbury, 1999, p.17

By the time the Cullen Inquiry Part 2 reported (2000-2001), this situation remained substantially the same, (Evans 2000). Part of this arises out of the relative lack of data for individual companies especially in relation to fatalities.

An example of this is their views on the risks connected with the employment of contractors on the line. Historically this group have been the most vulnerable to accidents and fatalities on the rail network. [307] Nonetheless, the approach of individual TOCs has been a variable one. As Evans concluded:

> "Trackside workers are the most exposed group of workers for companies which were infrastructure controllers. Some combination of driver, shunters, maintenance, cleaning staff and train crew represent the most exposed group of employees of TOCs. Only two companies estimated the individual risk to different groups of staff explicitly."
>
> [Evans 1999 & 2000a]

The singularity of risk assessment makes consistency in decision making about risk almost impossible. Also, it is almost impossible to compare risks between one TOC and another and hence it's hard to assess how effective procedures are, (Evans & Horbury, 1999: 17). Thus they conclude:

> They are therefore more useful to those who produce them than to those who read them.
>
> [Evans and Horbury 1999:23]

Where QRA has been used it has not been a universally happy experience as the HMRI comments in their 1996/7, 1997/8 and 1998/9 reports illustrate. These reported that the use of QRA and the ALARP principle was seen as promoting the status quo rather than driving forward safety measures. Thus they considered the companies' use of risk assessment as being:

> Seemingly more often designed to justify avoiding additional work rather than supporting the need for it.
>
> [HMRI 1997: para 74]

Moreover, there seemed to be a lack of competence in handling them. In a 1998 report, they found that nearly half of the organisations undertaking risk assessments were having difficulties – primarily in identifying the hazards

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[307] See for example, data from the Annual HMRI reports.

to be assessed. This led the HMRI to deduce that they were didn't fully understand what risk assessments were both for and what they were about. [308] A year later, which included the Southall crash, they were more sanguine about the companies' willingness and ability to use but exercises were still being done in a one dimensional and simplistic way.[309] Moreover the HMRI doubted their commitment to take the process seriously:

> (The) Railways Safety case attach great significance to the findings of major risk reviews as to the means to justify operational arrangements. However, it is very rare to find a major risk review that has resulted in the modification of an operator's activities.
>
> [HMRI 1998]

Principal among the techniques has been the use of Cost Benefit Analysis, sometimes to the detriment of other approaches. As the HMRI stated:

> The HMRI is becoming increasingly concerned at the wholly unjustified faith which many railway managers have in simple numerical risk assessment techniques, which often seem to be used as a substitute for decision making rather as an aid to prioritisation of effort.
>
> [HMRI 1997: para 73]

This section has pointed to the degrees of discretion allowed to TOCs in how they organise themselves to achieve Group Standards and to construct and operate their Safety Case requirements. It has shown that this has given rises to considerable variation in the quality of performance by safety case holders. This places the onus on the cascade of safety to work and for especially HMRI and Railtrack to monitor the quality of safety cases over time and to enforce regulations and procedures Given this, and Railtrack's pivotal position in ensuring safety, their system of auditing safety case holders, (some 68 organisations,[310]) is vital in ensuring that safety management systems are in place to achieve compliance to core standards. [311] This is the subject of the

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[308] "Evaluation of the Six Pack Regulations". HMSO, 1998.

[309] Thus 1998/99 report explicitly talks about QRA being "performed in a simplistic way" p. 113, para 467.

[310] Nelson, A, Deputy Director, Railway Safety, Railtrack. (2001), *Modern Railways*

[311] As Cullen commented: "Failure to adhere to a Group Standard is treated by the HSE as failure to comply with a safety case." Cullen Part 2 Inquiry, para 6.20, p. 83.

next section, which will also illustrate some of the organisational problems that have arisen as a result.

Safety Cases and Group Standards: the Audit

> I regard it (auditing) as a quality assurance exercise. It is an assurance under the current regulations to Railtrack that the operator is complying with the requirements of its safety case and therefore, not importing risk to Railtrack's infrastructure.
>
> [Muttram 2001a: 65]

> An RSC is no more than a document.....safety requires the contents and commitments of the RSC to be reflected in operational standards and procedures, and those in turn to be reflected in day-to-day action on the ground.
>
> [Evans & Horbury 1999:15]

> "The purpose of the audit is to enable TOCs to demonstrate that they are meeting Railtrack's RSC requirements and their own RSC commitments, demonstrate that Railtrack is complying with its own RSC, document the audit trail for those and include specific items of concern when agreeing the remit of the audit....It is described as a compliance audit and it is compliance with regulations and the Railway Group Standards rather than perhaps the more objective setting things that might be in the railway safety case.
>
> [Waite 2000: 48]

> Railtrack do not undertake a formal review of the overall safety performance of TOCs against their accepted RSCs
>
> [HMRI 2000: 52].

Railtrack and Auditing

> I think that audits need to look further down the process. It needs not just to look at the process which is in place; it needs to actually ask some fundamental questions in the audit as is this process actually delivering safety at the end.
>
> [Coleman 2001a: pp.19]

Witnesses to Southall and the two Ladbroke Grove inquiries commented on the importance of the audit system on. Railtrack and later 'Railway Safety' has a special section to consider the safety cases and to conduct safety audits. However, they also stressed that their purpose wasn't to *control* the TOC's activities but to 'assure' themselves that risks imported on to the system are being controlled by TOCs.

It is not intended to give an absolute control of the output of another duty holder's process. That is for that duty holder to be sure that its safety management system is operating correctly. It is an assurance exercise for Railtrack to validate that that operator is operating its own safety management system satisfactorily.

[Muttram 2000: 31]

Originally, the procedure was to 'farm out' proposed cases to individual experts within Railtrack. These panels were chaired by ex BR engineers- the main idea being to discover whether the TOC management team would be committed and understood the safety case they proposed. This included whether they were comfortable with it, as opposed to merely reciting it.

After the TOCs have been licensed the Railtrack audit department checks and audits them within 6 months of beginning of operations, and thereafter, once a year. This process has continued to date and despite the change in the balance of responsibility of accepting of safety cases brought about by the 2000 Safety Case Regulations,[312] it is Railtrack in the form of Railway Safety that remains the principal decision maker when reviewing safety cases. Such annual reviews are usually confined to Rail Group Standards, (RGSs), with the safety case as whole is reviewed every 3 years, with again Railway Safety responsible for the assessment. However in this respect, there are a number of issues that have arisen. Firstly there is the matter of the scope and competence of the audit process.

The Railtrack officials giving evidence to the Cullen part 2 Inquiry emphasised that an annual audit was a thorough exercise examining the way in which TOCs met Rail Group Standards. But this isn't the same as auditing the Rail Safety Case, (RSC), as the rationale of a safety case is to ensure that the competence of the management systems behind the adherence to RGSs – not merely observance of them, (see above). But remarkably, whilst Railtrack has 'strong control' over whether they accept a TOC's initial safety case, the situation over re-acceptance after the triennial review is much less clear.

Thus whilst Railway Safety has the power to review the RSC, if evidence emerges that individual TOCs aren't complying with their own safety

[312] HSE 2000

case the options open to Railtrack are confusing and limited. For example a TOC can continue to operate even if the review finds that there are serious non-compliance of their own safety case. Railtrack can make 'reasonable requests' for TOCs to comply,[313] but as of 2000, it still wasn't clear what exactly this meant and what sanctions could be applied. As a result, up to 2000 Railtrack hadn't imposed sanctions of any note against non compliant TOCs. [314]The emphasis being on exultation and persuasion, with for example no moves were made to deny a TOC access to the infrastructure as a result of failings in delivering safety. As Muttram explained denial of access to the track was the equivalent of pushing the nuclear button: being very destructive and thereby highly unlikely to be ever used:

> And what I consider to be the nuclear weapon of suspending the track access agreement, use of a commercial contract to deny the operator access to the track. That is an enormous sanction to use in the case of what may be a relatively low risk deficiency and probably introduces more risk by denying access to the network for passengers than the risk it is seeking to control.
>
> [Muttram 2000: 14-15]

Not that safety considerations were paramount in this refusal to wield the ultimate sanction. With Railtrack receiving some 80% of its' income from them, decisions to grant TOCs access to the network are still based overwhelmingly on commercial matters as agreed in Track Access Agreements, (TAAs). Again Muttram pointed to the delicacy of the situation whereby the supplier threatens the customer with fines and withdrawal of services for breaches of safety:

> In a normal factory environment most of the people to whom these sort of provisions provide would be suppliers, and there would be no problem really with the premises controller simply telling them to stop work or evicting them from the premises or imposing some kind of 9financial sanction through the contract. It is only the fact that Railtrack is acting with the TOC as a customer but imposing these safety conditions of access and the thing flowing in the two different directions that makes some sort of financial sanction rather difficult, I would suggest.
>
> [Muttram 2000: 6-7]

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[313] Regulation 3 of 1994 RSC Regulations

[314] HMRI, 2000, p. 87. See also the DETR report, 'Railtrack's Safety and Standards Directorate, also known as the 'Tansley Report'

TAAs are conducted between Railtrack, TOCs and the Rail Regulator, (see above and Chapter 3). The HMRI commented unfavourably about this:

> In these negotiations there appears to be little consideration given to past safety performance of the individual TOC.
>
> [HMRI 2000: 87]

The failure to impose sanctions was again subject to criticism by both major reports on the topic. Thus the HMRI again:

> In summary, the absence of an escalation policy (of sanctions) supported by clear criteria, results in Railtrack exercising only limited control over the TOC once the RSC had been accepted.
>
> [HMRI 2000: 87]

This issue was addressed by the 2000 Railway Safety regulations but again these too are ambiguous talking again about Railtrack's obligation to 'take all reasonable steps' to ensure TOCs complied with their safety cases.[315]

Aside from not having worked out what sanctions to impose on errant TOCs, Railway Safety doesn't undertake a formal review of the overall safety performance of the TOC and thus isn't able to come to a judgement on how it compares with the standards required by its' safety case. As Waite observed after the ENTEC report:

> They are in part an audit of the railway's safety case compliance with the regulations and Railway Group Standards rather than an audit of the company's compliance with its own railway safety case.
>
> Well, I can only say that the reports of audits that I have seen do concentrate -- the bulk of them are on Railway Group Standards and the majority of the rest is referring to specific regulations, rather than using the railway safety case as the audit tool.
>
> [Waite 2000: 15]

Perhaps this wasn't too surprising given that as of November 2000 Railway Safety had no identifiable position or individual responsible for assessing TOCs' safety performance and correcting any failings.[316]

[315] Railway Safety (Safety Case) Regulations 2000. (HSC 2000b).

As the HMRI amazingly concluded of the way Railtrack assessed RSCs audit system, it in effect:

> Railtrack do not undertake a formal review of the overall safety performance of TOCs against their accepted RSCs.
>
> [HMRI 2000: 52].

Such was the dis-satisfaction with Railtrack's efforts to assess RSCs that in their 2000 Safety Regulations, the HSE pointedly defined what it considered to be the character of audits that they expected Railtrack to undertake in the future. This stressed the importance of examining the adequacy of the management of systems to deliver safety.[317]

In the absence of such a systematic review, Railtrack have concentrated on the degree to which TOCs comply with Rail Group Standards, (RGSs), but even here the coverage and auditing system is at best partial. In November 2000, Muttram testified that the process was a 'bottom up' survey whereby a Railtrack auditor would examine all aspects of the TOCs operational arrangements.[318] Thus he 'expected' that auditors would visit not only management, but also assess the situation at the operational front line. The principal way this is done is by examining TOC performance on RGSs. However, despite Muttram's assurances this is not as comprehensive as they assert. Thus of the 300-400 RGSs Rail Safety Case holders have to observe, Railway Safety only look at a core of 38, or approximately 10% of the relevant standards. (Until 2000, only 20 RGSs were identified and audited.)[319] In the ENTEC report specially commissioned for the Cullen Part 2 Inquiry, Waite found that the TOCs he examined were only judged on 25. Examination of

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[316] Ibid. p.49.

[317] Thus: " 'audit' is defined as 'systematic assessment of the adequacy of the management system to achieve the purpose of delivering safety." HSE 2000b.

[318] Although this only happened after 1999.

[319] 'The Management Of Safety By Railtrack', HMRI, 2000.

any more RGSs was considered to be 'onerous'[320] One of the RGSs *not* examined was RGS GO/OT00013, the interpretation of which was one of the major causes of the Southall crash, (see above).[321]

With these, Railtrack has tended to concentrate on generic issues and aspects of TOC operations where they directly overlap with their own operations, rather than reflecting the individual circumstances and operations facing TOCs. As Muttram confirmed at the Cullen Inquiry:

Hamer: In practical terms, would you agree that Railtrack's principal concern as the infrastructure controller is to know that any train which comes onto its infrastructure is mechanically and electrically compliant with the track and signals and that the TOC has competent drivers?

Muttram: And that it has been properly maintained.

Not with how TOC management seeks to deliver such standards.

As the HMRI concluded:

> The absence of a systemic approach to auditing RGSs, their compliance and fitness for the purpose, has been identified as a weakness.
>
> [HMRI 2000]

But it's not only the extent of the audit that has been criticised, other issues have arisen concerning the resources devoted by Railtrack to the auditing process and the way their results are acted upon. One example of this came to light the Southall Inquiry when the actions of one of Railtrack's auditors brought the whole process into question.

Railtrack and the Audit: the Case of Great Western Trains and Southall

> Here you are in your office, in April 1996; you've got two bad reports of non-compliance. You don't send them to HMRI, or HSC. You take the decision that there's no risk to the network. The two questions I have to ask you is: why did you take that decision? Isn't that a decision for the HMRI?
>
> [Hamer's cross-examination of Seibert 1999][322]

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[320] Muttram 2000, p.56.

[321] Muttram, 2000, p. 35.

In November 2000, Rod Muttram testified to the Cullen inquiry that the Railtrack Audit was comprehensive and thorough. This has already been challenged in terms of the degree to which it can be said to be comprehensive. Additionally, this section will examine the validity of such a claim by examining how Railtrack reacted to finding serious defects in how the management of Great Western Trains (GWT) sought to manage its safety case. (It should be noted that at the conclusion of the prosecution of GWT by the HSE, the trial judge pointed to the role management failings by GWT played in the underlying causes of the crash, see Appendix xxxx.)

Muttram testified that audits were comprehensive in that Railtrack's auditors did not confine themselves to asking questions of the management, but also investigated the reality at the ground level. This he saw as vital if safety cases were to fulfil their role as 'living documents.' Thus:

> But I believe my auditors who carry that out are quite clear that what they are looking for is evidence...that down at ground level the system is actually operating.
>
> [Muttram 2000:31]

However, this was not borne out by the examination by counsel at the Inquiry and other witnesses at both the Southall and Cullen Inquiries. Thus Muttram conceded that the bulk of work done by auditors was office based

> it is an office based exercise in that it is looking for evidence that the audits have taken place, that the audits have produced results and that things shown to be deficient during those audits have been followed up.
>
> [Muttram 2000: 27]

But he denied the suggestion that it was akin to a 'paper chase' even though the evidence in the form of Railtrack's own protocol, or guidance for its auditors suggested otherwise. Thus Garnham, Counsel to the Inquiry pointed out guidance when auditing the activities of safety critical workers:

> Reading this it looks as if the instructions are directed to the top down audit, making sure the paperwork is in order and so on.

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[322] Kenneth Hamer was the legal representative for the Passengers' Steering Committee at the Southall Inquiry. Brian Siebert was Controller of Safety Assurance, Railtrack 1992-1998, see below.

[Garnham 2000: 30]

Waite supported this view. Thus in an exchange between him and Chris Jackson, representing ATOC:

Waite: The audit practice appears to adopt a similar approach to a certification audit, prescriptive checking of systems compliance rather than being designed as part of an objective orientated safety regime.

Jackson: That sounds like it is a tick box system?

Waite: Yes.

By contrast, there were no guidelines for talking to front line staff, and Muttram couldn't point to any document that would deal with these issues.

The notion of audits being essentially paper exercises was given extra credence by the evidence of two of Railtrack's own auditors at the Southall Inquiry in November 1999. David Parkes was responsible along with his immediate superior, Brian Siebert, for auditing Great Western Trains, in the months and years leading up to the Southall crash in September 1997. This amounted to four audits between December 1995 and June 1997, two of which were annual audits, one a special investigation into the condition and maintenance and one in June 1997, into a case of non compliance with GWT's safety case. Their evidence revealed the essential nature and approach taken by auditors. Thus the emphasis was on an examination of documentation, rather than getting to assess the reality on the line operations. For example, the Railtrack audit report for January 1997 stated that:

> The auditor visited the driver manager West of England and checked the relevant documents in respect of compliance with the standard were in place and operating as intended.

[Railtrack 1999]

In this they were heavily reliant on management assurances that standards were being adhered to. When cross-examined about this statement by Kenneth Hamer[323], Parkes conceded that this was in essence a paper chase. [324]When asked if he had discussed issues with for example front line staff when auditing the condition of the rolling stock and train operations in January 1997, including the adequacy of how safety equipment was maintained and driver competency, to operate it, Parkes replied *"I don't recall talking to any drivers on that particular occasion."* Rather he was content to examine health and certification records of a sample of the driving staff to see of they were competent. One of the central issues surrounding the Southall Crash was that GWT had not fully trained its drivers to use the ATP equipment which was turned off on the fateful day, (see Appendix 3).

As has been previously established, the remit for annual audits was limited to a cross section of Rail Group Standards, (RGSs) designed by Railtrack to cover the main risks associated with train operations. Beyond that it required auditors to identify particular problems and hence add standards to be investigated to the core of RGSs. It should be noted that in the context of the Southall Crash, RGS GO/OT0013 concerning the non-functioning of safety equipment, (see above and Appendix 3) was one standard *not* included in the audits. In this sense the audits were essentially reactive. One of the reasons for this approach is the resources that Railtrack devoted to the auditing process. Thus in 2000 Muttram stated that only 15 auditors were employed to cover 25 Train Operating Companies, all of whom needed an annual audit. Over and above this given that 68 organisations in the rail industry hold safety cases, the potential workload could theoretically be even heavier. The pressure to cover at least 25 audits led the time devoted to be at

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[323] Counsel for the Passenger Steering Committee at the Southall and Cullen Inquiries.

[324] Thus Hamer: "when you say, "In the main, effective systems are in place and being applied in compliance with the standard." The words, "being applied" is simply a reference to saying : "Yes, I've been through the files and there are documents in the files concerning, for example, medical records and so on?"

Parkes: Correct.

Evidence Day 15, Southall Inquiry.

most one working month, nearly half of which would be spent writing up an auditor's report.[325]

If the adequacy of Railtrack's auditing system was questioned, a more damaging allegation was that the motivation for audits was to ensure that Railtrack had been seen to have doing something, rather than monitoring TOCs effectively. Thus Garnham again:

> Can we look for the moment, please, at page 332 in this document (the protocol)? It might be suggested that the motivation for these auditing activities is to enable Railtrack to assert that they have checked that those using the infrastructure have said that they have the appropriate systems in place rather than that they actually do.
>
> [Garnham 2000]

Muttram rebutted the allegation stressing that audits were followed up by extra audits to check on progress, thus:

> I think I would draw your attention to the minutes and resultant actions from the follow-ups to audits, the corrective action plans produced by train operators and the follow through of the corrective action that those action plans require, some of which can be very onerous in terms of our improvement of the operators' safety management systems.

However this was directly contradicted by the results of the HMRI report (2000) which revealed that when auditors uncovered deficiencies, there was little sense in which Railway Safety checked that these were addressed sufficiently quickly and effectively. [HMRI 2000: 49].

As Garnham pointed out when he asked Muttram directly about the quality and relevance of auditing at all, prompting Muttram to be very defensive:

Garnham: The second bullet point is the evidence that some audit deficiencies have been identified by previous audits but have remained unresolved. If that were true it would make auditing pointless, would it not?

Muttram: Yes, it would.

Garnham: Is that a fair observation now?

---

[325] Evidence from David Parkes, Day 15, Southall Inquiry.

Muttram: I wish I could give you an absolute assurance that every audit action is followed through. I cannot give you that. I believe it has improved significantly.

Whether or not the situation had improved by November 2000, it certainly wasn't the case in their dealings with Great Western Trains, (GWT), in the months and years leading up to the Southall Crash. This was confirmed by the actions of the Railtrack auditors David Parkes and his superior Brian Siebert, which revealed a general lack of urgency and not a little naivety when dealing with GWT.

Thus in September 1995 a Railtrack audit initiated by an accident at Maidenhead, found that in the space of 15 months what had been regarded as a very good safety case had deteriorated and that there was a breach of the Rail Safety regulations such that GWT were effectively not complying with their Safety Case. As Siebert reported: "The management had taken its eye off the ball." [Siebert 1995; 1999].

Specifically they found that there had been breaches of a number of RGSs concerning the safety competence and training of their train drivers vis a vis SPADs. This included a lack of action to train drivers in the use of the Advanced Train Protection, (ATP) even though part of the criteria for accepting GWT's safety case was the specific undertaking to participate in a trial project on operating the technology. In terms of management systems, they found that designated safety managers had not been competent enough. Thus:

> Senior managers have been tasked with specific safety tasks they couldn't establish systematic delivery of their responsibilities...the safety management system was not consistent throughout the organisation.
>
> [Parkes 1996: 207]

Moreover the safety manager had responsibilities in terms of operating trains and also had to report to the Director of Group Operations. Such a lack of independence led Parkes to conclude that there was a danger of conflict of interests arising between train performance and safety.[326] These factors

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[326] Parkes November, 1999.

meant that GWT were not complying with their own safety case and thereby breaching Regulation 7 of the 1994 Regulations.[327]

The following audit in April 1996 not only revealed that the situation hadn't changed, but that GWT hadn't formulated any plan of action to sort things out, despite promising to do so. It should be noted that on the issue of train drivers' safety training as regards SPADs[328], Parkes only consulted managers and not drivers, reinforcing the point about the diligence with which audits were undertaken, (see above). Again despite expressing concern over the summer of 1996, Railtrack left the issue to GWT's devices. This despite Muttram's assertion four years later that:

> We certainly pick up lots of deficiencies in the way in which operators are complying with their railway safety case and we produce corrective action plans that cause those deficiencies to be corrected.
>
> [Muttram 2000]

A series of minor incidents over that summer prompted Railtrack Great Western Zone[329] to ask the auditors to conduct another special investigation. This time into GWT's procedures into maintaining their rolling stock, including safety equipment. This report carried out in the autumn of 1996 and completed in January 1997 also found breaches of the safety case.

At this point the Railtrack auditors acted for the first time by writing to the HMRI notifying them that GWT were in breach of the 1994 Regulations - the very basis of an operator being able to run a rail service at all – on the basis that there were*: "uncontrolled risks to the extent that HMRI should be made aware of."* [Siebert 1997]. However, Railtrack didn't go beyond the bare minimum of asking GWT to make reasonable steps to remedy the situation, preferring to wait until the next audit to determine whether anything had been

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[327] Regulation 7 states that: "where a person has prepared and accepted the Safety Case pursuant to these regulations, he shall ensure that the procedures and the arrangements described in the Safety Case and other provisions thereafter, are followed."

[328] Signals Passed at Danger.

[329] One of the seven such geographical 'zones' that Railtrack Line, the operational arm of Railtrack, is split up into.

done.[330] What's more in February 1997, David Rayner, Railtrack's chief safety officer wrote *in support* of a GWT application for a franchise to operate trains in the North West of England. Even though he had expressed concerns over GWT's ability to run a rail service safely. This reveals the degree to which auditors could exercise discretion. This was borne out by the results of the next audit, the annual one in June 1997. As a result of this Parkes concluded that there had been a 'vast improvement' in the management systems and staff understanding of what was required of them.

However again the audit was confined to discussions with middle management. Moreover, there still appeared to be areas of operations where there was non-compliance of regulations, 6, 9 and most crucially regulation 7. This prompted the following exchange at the Southall Inquiry:

Hamer: are you saying that, do you think that the position was, to use the word, rosier in the Summer of 1997 compared to earlier?

Parkes: certainly they had made significant progress on previous report findings, which was the key focus in this particular area.

Hamer: but you are not able to say, of course, that the company was running a safe ship?

Parkes: most definitely.

Hamer: Exactly and one must never forget that the company did plead guilty to three breaches of the health and safety act?

Parkes: Yes

Hamer: in the area you were auditing?

Parkes: Yes

Hamer: so it must follow that in the summer of 1997, the company is likely to have serious problems with its' compliance with all regulations for safety?

Parkes: Yes.[331]

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[330] As Parkes stated they didn't help in formulating plans of action. Thus: "We only respond." November 1999.

[331] Some 3 months before the Southall Crash.

A clue to the motives behind the apparently paradoxical stance adopted by the auditors whereby continual non-compliance was tolerated and company performance in some incidences was praised, comes with the evidence of Brian Siebert. He was asked why Railtrack had delayed informing the HMRI of the breach of Safety Case Regulation 7 concerning the failure of the company to observe its own safety case. Thus:

Hamer: why didn't you refer the matter in April 1996, when you had two bad audits in front of you?

Siebert: at that stage sir, I didn't believe that they were presenting a *risk to the network* that was so significant that I should bring it especially to the attention of the HMRI.[332]

Hamer: but the point is that Regulation 7 does not refer to breaches, or risks, to the network, it refers simply to a breach of the safety case regulations. Why should you take the decision whether there was a risk to the network?

Siebert: My role within Railtrack was to advise the board on just those sorts of issues.

Thus Siebert was taking the view that decisions on actions and referral about breaches should be based on an assessment of the risks they pose, whereas the Regulations are prescriptive in that if there was any degree of non-compliance with safety cases, companies are *de facto* in breach of regulation 7 and thereby be liable to action from the HMRI.

The incident also shows an over reliance by the auditors on GWT's management and trust in their integrity. Thus after reporting GWT to the HMRI, a subsequent meeting was arranged with the GWT management at which they assured Siebert that things were being addressed although they couldn't produce the actual documents to support their assertion. Nevertheless, Siebert rescinded his reservations about GWT's ability to operate a service safely, less than a month after alerting HMRI about his concerns. The subsequent annual audit in June 1997, found that things had improved such as to remove concerns about GWT's abilities. Although

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[332] My emphasis.

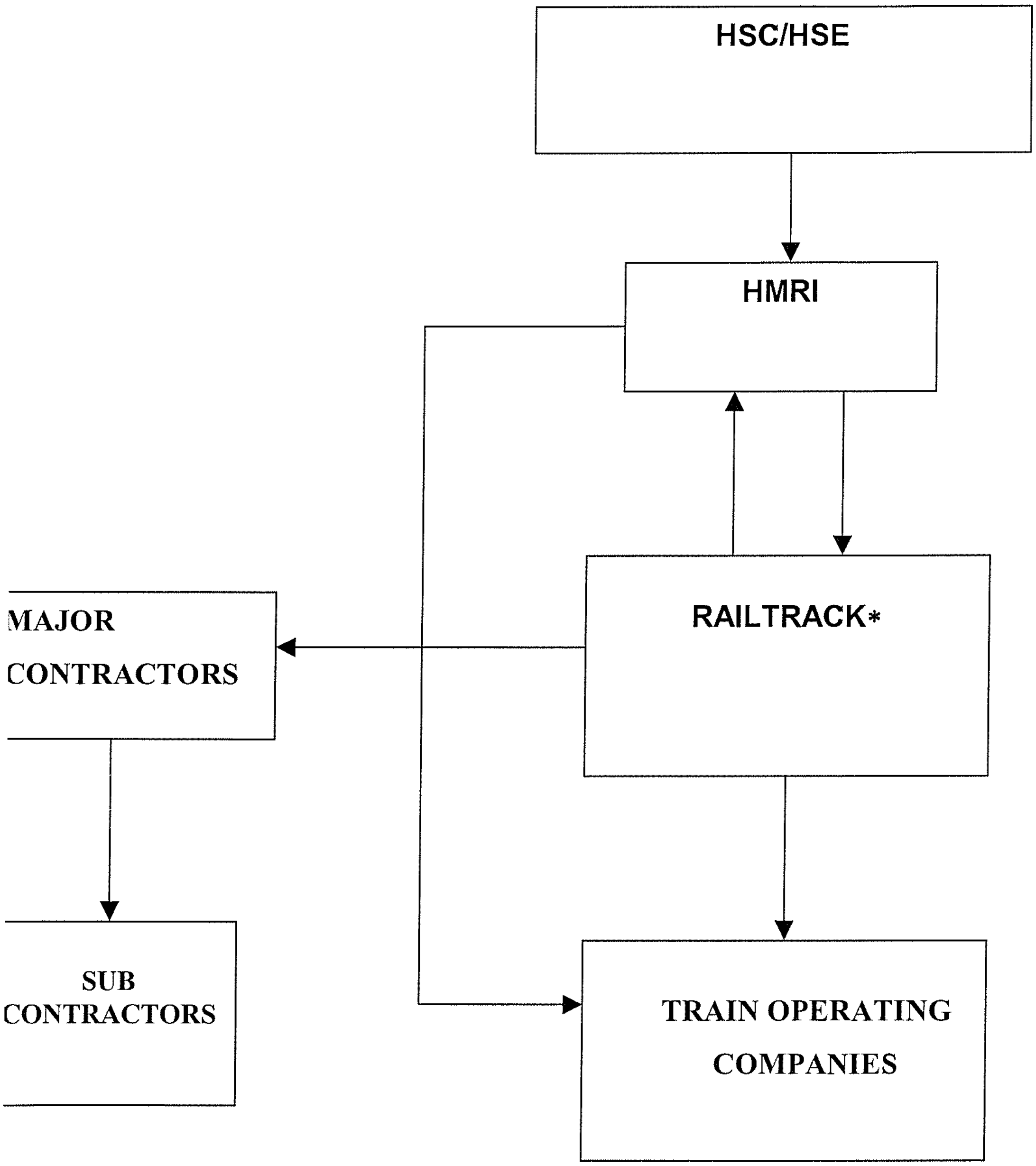
perhaps the telling statement about this audit was the author's criticisms about his own report. Thus Parkes:

> Audits attempt to cover too much and result in an extremely shallow examination of the safety case compliance.
>
> [Parkes 1997; 1999]

Three months after the June 1997 audit, the Southall crash occurred, resulting in Great western Trains being prosecuted and fined for 3 breaches of the Health and Safety At work Act.

This chapter has demonstrated that as the privatised industry fragmented responsibility became similarly divided and diffused. Instead of a single operator and regulator - British Rail and the HMRI respectively – the industry spawned myriad organisations and three regulators that impacted on safety. To ensure safety in the new circumstances, a new safety regime was proposed. This allocated responsibilities through a series of levels or tiers in a cascade, from the HSE at the top, to the train operating companies at the front line. This pyramid approach has remained intact despite the reservations aired at the Southall and Ladbroke Grove Inquiries. The only development has been the passing of the Rail Safety Case Regulations which has hardly changed the relationships at all. Thus the only development has to give the HMRI more direct responsibility vis a vis those aspects of Train operations that don't directly concern 'Railway Safety'.

Figure 7:The Pyramid of Safety 2000/2002



Central to this cascade has been the adoption of the Safety Case system, to ensure that sufficient management systems are present to meet levels of safety performance. An integral part of this has been the notion of risk assessment and the use of QRA techniques in particular, in order to create a uniform approach to identifying risk and assessing it.

However it has also been shown that this approach has been far from successful because individual TOCs have perceived and prioritised risk differently. Given this, the Chapter also demonstrated that Railtrack has played a pivotal role in monitoring the performance of individual safety case holders. Central to their approach has been the attempt to relate the principals of QRA and Cost Benefit Analysis to their creation of Railway Group Standards and their assessments of TOCs' performance against them. In this, it has been shown that they have only been partially successful.

If Railtrack can said to be the industry's monitor and the first line of judgement on the competence of train operators in safety matters, the ultimate tier of the cascade of safety is the HSE in the form of the HMRI. The degree to which they have been effective as enforcers of safety is the subject of the next Chapter. Additionally, the role of the safety and economic regulators in managing and affecting attitudes to safety will be examined. This will be complemented by an examination of the of literally thousands of organisations that aren't required to hold a Safety case, but nonetheless work along side safety case holders as part of the industry.

Chapter 7: The Open System Part 2: The Regulators and the Contract Culture

> The present regulatory approach does not appear to offer sufficient assurance to the public, because the commercialised rail industry is also subject to pressures from the economic regulator and from shareholders.
>
> [HSE 2000]

The last chapter has discussed how as the industry was privatised industry fragmented responsibility for safety became similarly divided and diffuse. Instead of a single operator and regulator - British Rail and the HMRI respectively – the industry spawned myriad organisations and three regulators that impacted on safety. The proposed solution was a cascade, or pyramid system which allocated responsibilities through organisations at a series of levels or tiers. from the HSE at the top, to the train operating companies at the front line. The crucial element in this arrangement has been Railtrack as the importer of risk on to the network. However, the ultimate tier of the cascade of safety is the HSE in the form of the HMRI. The degree to which they have been effective as enforcers of safety is the subject of this first section of this Chapter. However, there are other regulatory bodies such as the Office of Rail Regulator and the SRA (formerly OPRAF), who concentrate on economic and performance issues. These will also be discussed in terms of how they impinge on safety in the industry.

Finally, there will be discussion of the ultimate in the open system: the effect of the contract culture as outlined in Chapter 3. This will be done by discussing the effects of the major change brought about by privatisation, namely the creation of literally thousands of organisations that aren't required to hold a Safety case, but nonetheless work along side safety case holders as part of the industry.

HMRI

I trusted them (*the rail industry*) too much

[Coleman 2001][333]

"They pick them *(HMRI inspectors)* up off the streets"

[Anon 1999][334]

They're policemen following rules.

[Anon 1999]

The HMRI's position in the rail industry dates back to the Regulation of Railways Act 1840 and its duties have been extended and refined in successive Acts since.

Thus as early as 1842, their powers extended to postponing the opening of lines if there were any concerns over safety. The 1871 Railway Act enabled inspectors to conduct investigations into accidents without the permission of the train companies However, However, from the beginning their powers were relatively circumscribed and reactive in nature. Thus for example under the 1842 Act it was clear that once a railway line was opened, it was clear that responsibility for safe operations would rest with the operators[335]. Furthermore, examining the causes of accidents and publishing non-mandatory recommendations was by its very nature a reactive approach and did not include proactive considerations of the health and safety aspects of train operation. As Hutter stated:

> The history and philosophy of the Rail Inspectorate is in many respects geared to accidents, rather than safety.

[Hutter 1997:34]

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[333] Chief Inspector, HMRI 1997-2002

[334] October, 1999. An interviewee that worked for Railtrack 1994-1996 and has since set up as a freelance consultant and expert made this remark. He wished not to be quoted directly.

[335] See for example Coleman, 1999.

The emphasis towards being proactive began with the 1933 Road and Rail Traffic Act which required train companies to inform the Inspectorate of any new works that they intended to undertake. But it wasn't until the 1974 HSAWA that investigating the health and safety implications of rail operations became a central concern and a more overtly proactive approach was taken towards to identifying risks in rail operation.

This continued and developed with the Inspectorate's transfer from the Department of Transport to the HSE in 1990-1995. This period was also characterised by the increased recruitment from within the HSE itself and with it the adoption of QRA methods, (see Chapter 2).

The privatisation of the rail industry from 1993 onwards also extended the role and responsibilities of the Inspectorate regulating and overseeing the new, so called cascade of safety, involving a number of new, specific responsibilities. Short (1995) summarised them thus:

- To Accept Safety Cases
- To Regulate Infrastructure Controller's acceptance of safety cases
- To Inspect/ audit operators' compliance with safety cases
- To Inspect audit/ infrastructure controller's enforcement of operators' safety cases.

These involved assessing:

- Whether existing standards of health and safety were being maintained, and suggesting where they could be improved.
- The system of infrastructure controllers accepting operators' safety cases and monitoring their compliance working.
- The procedures and arrangements in safety cases being followed and whether they were complying to approved standards.

Additionally since 2000, the HMRI has been responsible for those areas of train operations that the infrastructure provider, (i.e. Railtrack) isn't concerned with.[336]

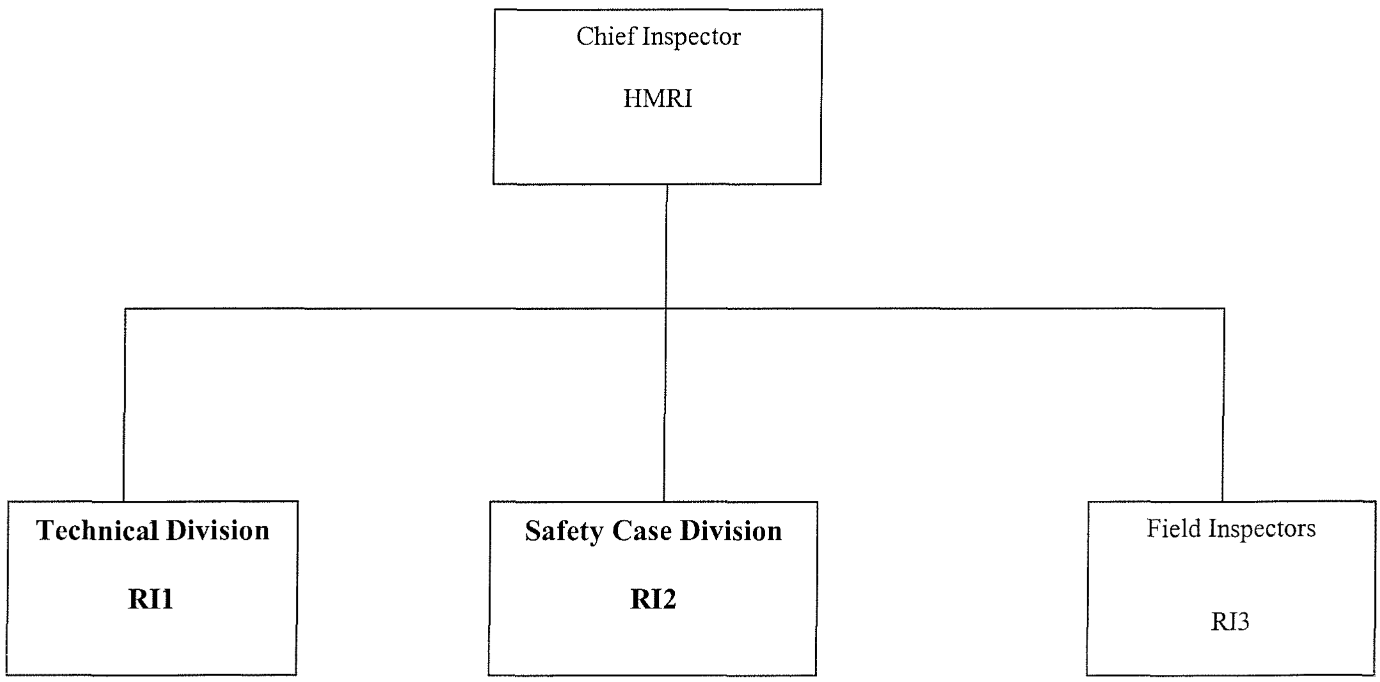
[336] Such as for example, the interior design of passenger carriages. For more details see the Railway Regulations, 2000. HSE Books.

Investigating accidents and dangerous occurrences, and random inspections of railway premises does this. Thus teams of inspectors, based on a regional basis conduct random preventative inspections of railway work sites, as well as investigating accidents and complaints and monitor compliance with Railway Safety Cases.

If such standards aren't maintained then the Inspectorate have a number of powers to enforce them including the issuing of Improvement Orders and enforcement orders requiring works to be raised to acceptable standards. It also has powers to issue notices where potentially dangerous procedures need to be improved or where there are breaches of legislation. . How they carry out these tasks and their efficacy is the subject of the following sections

However, before that it would be instructive to consider briefly the way the HMRI is organised as it points to some of the shortcomings to be discussed.

Figure 10: The Structure of HMRI 2002



The present HMRI reflects the extension of responsibilities brought about by the 1993 Act. Thus it is separated into three divisions each headed by a Deputy Chief Inspector, which report to the Chief Rail Inspector, (see diagram). The Technical Division deals with approvals and is also known as RI1. Safety cases acceptance comes under the Strategy, Planning and Safety Case Division and is also known as RI2. The Field Operations Division (RI3) has a number of local offices and deals with field activities including proactive and reactive inspection. However this is a comparatively recent transformation and is the product of several organisational changes over the decades. Before assessing it's efficacy as a regulator it is necessary to make some background discussion on some of the major changes to the HMRI.

Much comment has been made about the personnel and structure of the organisation and how it has changed since it was anticipated that the railways were to be privatised and the extra responsibilities to be assumed. At the beginning of its organisational life the staff were overwhelmingly recruited from the military and the Royal Engineers particularly.[337] At the time Holden joined the Inspectorate in 1950 this was still the case, as he recalled:

> The likely lads were selected by the Chief inspecting officer. I had known most of them for a very long time and so on. So there was an expectation that at least that there would be a certain number of military officers on the shortlist of candidates.
>
> [Holden 2000: 123]

But as British Rail shed its military background in the 1950s and 60s, the military presence in the Inspectorate gradually gave way to more former railwaymen becoming Inspectors. However, the two cultures were complementary in that they reflected the engineering approach to regulatory safety. But this began to change in the 1980s.

The most immediate sign of change was the retirement of Major C Rose as Chief Inspector of Railways in 1988 and his replacement by Robin

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[337] This because the reason of the railway experience acquired in the Royal Engineers because of the need to know how to build bridges, maintain embankments and indeed run trains to supply the troops.. "There was a chief and four Inspecting Officers and I joined as an Assistant Inspecting Officer." Holden, 2000.

Seymour. He neither belonged to HMRI, but as the former Deputy Chief of the Factory Inspectorate, had none of the engineering background of previous inspectors either. Similarly the old tradition of recruiting from the Royal Engineers was scaled down, with staff increasingly being drawn from within the HSE itself, with a generic understanding of health and safety; as well as ex-railwaymen. Thus by the time of Major Holden's retirement in 1996, there were no Inspectors left from a full time military background and only one Inspector with any type of military experience. Hutter (1997 and 2001) in her research also identified the different cultures that developed during the period.

The effect of these developments was to change the balance of the culture from within the HMRI from the old technical, prescriptive, approvals-type regime, to one stressing goal setting and risk based safety management systems approach of the safety case regime. [338] As one Inspector commented to Hutter:

> The most significant change in the move to the HSE was the increase in the management of us and the increased call on the one hand to account for what we're doing and why –justify ourselves....Demonstrate, prove, discuss (with) much greater management pressure to prove you are producing value for money.
>
> [Hutter 2001: 267]

However, Maidment in 1999, still pointed to the presence of the former engineers and estimated that the split between HSE appointees and ex-railway engineers to be 50: 50[339]. Coleman (2000) in an interview with the author also recognised the 'us and them' syndrome that divided the Inspectorate[340].

Still, Holden could reflect on the change of ethos that occurred from the late 1950s onwards to 1996; dividing the period as pre HSE and post HSE. Thus before the changes the Inspectorate were much closer to the whole of the industry:

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[338] Thus the HMRI is planned to double its staff to 200 by 2002, with the bulk coming from within the HSE. Coleman, V (2000c), Modern Railways, November 2000.

[339] Interview with author, October, 1999.

[340] April 12th 2000.

The culture suppose was that we needed to be in fairly close touch with the railway industry as whole, we met senior officers regularly, and it was I think to use the older term a comparatively light touch. The responsibilities were largely that for the approval of new works and accident investigation. The advent of the 1974 Act brought in, the duties of enforcing that Act were passed to the Railway Inspectorate as an agency of the HSE. That to a certain extent changed the relationship slightly in that we were formally now an enforcing agency and, therefore, there was a sort of a slightly less close relationship, but not by very much.

By contrast the post 1990 period saw a qualitative change in attitude:

The move to the HSE I think immediately put us into a position of being directed by another organisation whose ethos perhaps was not quite the same as ours. The feeling perhaps was that they were much more regulatory bound. If somebody failed to meet the regulations and so on you would prosecute .

[Holden 2000]

However despite the changes, the net effect was minimal because the HSE's approach to regulation was also to have a 'light touch' and not to be overly interventionist. As Bacon summed up:

The degree of statutory control shall be the minimum consistent with the need to ensure adequate and cost effective levels of control...and to secure public confidence.

[Bacon 2000][341]

This has led to accusations that the HMRI have become a 'captive' regulator in its dealings with the organisations it is supposed to 'police.' Rimmington[342] (2000) acknowledged the dangers associated with getting too close:

All industries desire to have their own safety regulator, all desire to 'capture' him, the smaller and weaker the body is, and the more isolated from other influences, the more likely it is to happen.

[Rimmington 2000]

There is a considerable body of literature on the subject of the subject of the relationships between Regulators and the regulated[343] Hutter (1989) in her study of three regulatory agencies in the UK, identified two main approaches: the accommodative, or persuasive approach and the insistent

[341] This is referred to elsewhere as the 'light touch' approach to regulation.

[342] Former Director of the HSE 1992-94.

[343] See for example Braithwaite, 1991; Hawkins, 1984; Hood, 1991; 1996; 1999, etc,.

approach. Thus the persuasive approach places emphasis on advice, guidance persuasion and negotiation. It concedes that adherence to rules and regulations aren't immediately achievable, with for example the use of devices such as prosecution or other legal sanctions being seen as the last resort. By contrast the insistent, or deterrence strategy stresses the immediacy of achieving compliance through the use of legal and financial penalties. According to Reiss (1984) and Hawkins (1984)[344], successful regulation is measured by the willingness and ability to undertake such prosecutions successfully.

The HMRI can be seen largely the former type of regulator, both historically and since joining the HSE. As an 1999 Internal Inquiry explained:

> The RSC Regulations were introduced during a political climate of deregulation. HSC and HSE envisaged that, with the introduction of the RSC regulations, the industry would be largely self regulating with HMRI exercising a 'light touch' in enforcement both in relation to dealings with Railtrack and the TOCs.
>
> [HSE 2000a]

Initially at least the HMRI were happy with this approach with for example, the Chief Inspector praising the new system to the 1996 Transport Select Committee:

> We are confident that the safety regime is fundamentally sound, and if operated properly it will provide the proper framework for maintaining and where and where necessary and reasonably practicable, improving standards of safety.
>
> [HSE 1996: Q405]

Coleman (2000) in an interview with the author whilst rejecting the notion of being captured, stated that the HMRI's task was 'to take people in the industry with us' as opposed to taking a punitive approach. Coleman (2000) while attempting to draw a contrast with the old HMRI identified the characteristics of a captured regulator:

> A group of people who share a common basis, that have all grown up in the same way in the same industry and are all involved in particularly narrow regulatory areas.

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[344] As cited by Hutter, (1989), p. 154.

However the HMRI shows undoubted characteristics of an organisation over reliant on the industry it is supposed to police. This can be demonstrated in terms of its function as an investigator, in its capacity as the approver of works and safety cases and in the last resort as a legal enforcer and prosecutor. . These aspects will be considered next.

Accident Investigation

As outlined in Chapter 4 and at the beginning of this chapter, part of the HMRI's duties as regulators is to investigate accidents and incidents. This is undertaken by Field Inspectors, in RI3, (see diagram). Eves (2000) characterised such investigations as comprising of three elements: technical, legal and advisory. The technical aspects involves the need to understand the causes of accidents and the consequent review of procedures and standards. The legal aspect concerns establishing whether a breach of the law – in this case the HSAWA – and whether there should be a prosecution. Finally, the advisory role where findings are disseminated to the industry as a whole.

The majority of investigations where Inspectors are involved are held in private and involve him/her acting alone to collect and assess evidence. There are typically 10-12 of this type a year. [345] For the major disasters, involving multiple loss of life which the HMRI judge to be of significant concern to the public, such as Southall and Ladbroke Grove, the HSE can commission Public inquiries, (see Chapter 4). However, in practice the ability to undertake such investigations is limited by lack of resources.

The HMRI has always been a relatively small organisation and under-resourced. In 2000 their staff was a total of 125, with only 70 Inspectors in the field covering the whole network.[346] Coleman in his evidence pointed to the difficulties of recruiting experts into the HMRI. As he put it to the Part 1 of the Ladbroke Grove Inquiry:

> Problems with filling vacancies within HMRI have become significant during the last two to three years, mainly affecting the Technical division and the filling of posts with staff with

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[345] Wells, p71

[346] Coleman, Modern Railways, November 2000.

technical knowledge and experience of the railway industry. 1st April 1999 figures represent a shortfall of 24 staff, including a shortfall of inspectors because of difficulties in recruitment."

[Coleman 2000a]

Part of the problem arises because the HMRI cannot compete with salaries offered in the private sector. [347]Such shortages have led to a situation where the HMRI have seconded staff from Railtrack on a regular basis - the main organisation they are supposed to regulate.[348] Indeed Coleman in his evidence to the Part 1 Ladbroke Grove Inquiry made a virtue of this, stating his belief that:

"In fact this is a very desirable piece of transfer for the benefit of the individual concerned so as to be able to work on both sides of the fence."

[Coleman 2000a]

Such lack of resources has given rise to a situation where Inspectors in the field are often handling literally dozens of incidents simultaneously, assessing whether they warrant investigation etc. This has led to a situation where some Inspectors work 30% overtime. [349] More importantly though is that it has led the HMRI to ration their investigations. Coleman (1999) outlines the criteria for HMRI investigations as being a balancing act between perceived seriousness of the incident and the costs associated with investigations. As said:

resources devoted to investigations must be properly targeted and used "proportionately" arrangements.

[Coleman 1999: 6]

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[347] A figure of 20% differential has been mentioned. Public Seminar, No 2, October, 2000. Another complication is that as part of the HSE, the HMRI must adhere to general agreements on pay scales and structures for the Civil Service, as negotiated with the Civil Service Salary Review Board and Public Sector unions etc.,

[348] Coleman, July 14th 2000.

[349] For example the field inspector supervising Railtrack over work on Signal SN109, the signal that was to prove instrumental in the Ladbroke Grove crash handled 45 accident cases in 10 months in 1996-1997. Cullen Inquiry, Part 1.

This leads them to balance the actual severity of an incident against more practical issues such as the likelihood of achieving results in the form of, for example, successful enforcement orders. This gives rise to another problem whereby decisions on whether to investigate concentrate on the actual consequences of the accident and their severity are considered, and not the potential severity. (The same criticism they make about Railtrack Line investigations.) On this basis, they 'aspire' to investigate 3% of accidents on the railway; leaving the other 97% for the industry to investigate itself via the internal industry inquiry, (see Chapters 4 and 6)[350]

This has had the effect of placing the HMRI in the subordinate role of relying on company/industry reports and information when assessing whether an incident however apparently trivial is nonetheless one that requires the HMRI to act, or investigate matters further.[351]

This also applies to what they call major investigations, such as accidents involving multiple fatalities such as Southall and Ladbroke Grove. External funding is available for such investigations, but again because of the acute financial constraints on HMRI, the technical investigations of any accident will to a large extent, still be farmed out to private sector organisations. As Coleman remarked:

> We do not carry the sort of numbers possible who are necessary for doing the kind of work which we called on them to do.
>
> [Coleman 2000c]

Again this inevitably means using experts employed or contracted to Railtrack and the rail companies. [12] As one participant to Seminar, 2 remarked: "The experts that don't work for Railtrack don't exist" [352]

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[350] Coleman 1999.

[351] Evidence by David Eves to Part 2, Inquiry, 14th November 2000.

[352] Ladbroke Grove Inquiry Part 2, Public Seminar No 2: "The Civil Aviation Model of Regulation." Held at the Westminster Central Hall, September 27th, 2000. It should be noted that access to the seminars was given on the condition that any evidence and opinions given

However major disaster Inquiries have highlighted a second concern about the HMRI's role in accident investigation: the effectiveness and appropriateness of the HMRI investigating such accidents at all.

In the case of Ladbroke Grove this led the HMRI investigating its own actions in the run up to an accident. Specifically, how Rail Inspectors allowed signals including SN109 to be left in service over a 5 year period, even though the work done in that area had not been approved by HMRI as being fit or adequate. This is discussed in greater detail below, but the Cullen Inquiry highlighted the potential problems of regulatory bodies involved in industries also undertaking

Specifically the charge is that there is potential conflict between the dual roles of HMRI as investigator into accidents and its function as safety regulator, with overall responsibility for safety on the railway. Thus arguing for a separate investigatory body, Smart, (2000) argued that accidents have implications not only for the operators in any given industry, but also the regulatory framework within which they operate:

> The accident investigation process has to take account, has to examine the regulatory framework within which the operation which has resulted in an accident has taken place, which results in us examining the regulator's role. Being part of the regulatory body would represent, in my view, a conflict of interest.
>
> [Smart 2000][353]

The fact of the investigatory body's independence would inspire public confidence in the process as a whole.

Safety case approval

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by individual participants were to be treated in confidence. Details of the times and purpose of the seminars are included in the appendices.

[353] Kenneth Smart, Chief Inspector of Air Accidents, Department of the Environment, Transport and the Regions - Air Accidents Investigation Branch.

The second area of responsibilities is in approving safety cases and any proposed changes. This is important aspect of their work given the heterogeneity of the 68 safety case holders.[354] Safety Case approvals are undertaken by the RI2 division, (see diagram). It has already been established that the HMRI have relied on Railtrack to more or less supervise these as part of their role in the safety cascade (see above) and the HSE philosophy of the 'light touch.' RI2's role is to review Railtrack's decisions. However RI2 staff's approach is to take only a sample look of cases presented and approval of safety cases and by no means are they scrutinised exhaustively.[355]

Secondly, in the first six years of the safety regime, there were no objective criteria available for RI2 Inspectors to decide whether Railtrack's recommendations should be accepted. In the absence of such standards, approval was left to the individual judgements and approaches of RI2 Inspectors. They were also given considerable discretion as to how they managed their own case loads. This resulted in severe backlogs developing, with the tendency for safety cases not to be scrutinised closely. [356]Thus up to 2000 not one safety case approved by Railtrack's safety division was contradicted by the HMRI[357]. Brown confirmed this source when he testified that; "none have been rejected but many had been commented on". However one could argue that this was tantamount to sophistry given his concession when pressed that most of such 'comments' were "We have no comment". In fact only 50% of cases attracted any comment at all. This chimed with the view of one interviewee who concluded that certainly as far as Safety Case approvals were concerned the HMRI acted as 'rubber stamps' for Railtrack's decisions. [358]

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[354] Muttram, 2000.

[356] HMRI, 2000. 'General Issues Arising from the Ladbroke Grove Rail Accident.'

[356] Coleman, 2000b.

[357] Private Interview with Railtrack Official, Railtrack House, November 11th 2000.

[358] Private Interview with former Railtrack official, October, 1999. See also the discussion earlier in the Chapter on Railway Safety's role in the approval of safety cases.

A more startling insight on this process emerged from one private interview undertaken by the author in which the subject stated that if Railtrack safety division encountered an 'awkward' Inspector who objected to their decisions they would simply be by passed by going over their head in the HSE it self.[359] These new Inspectors would be invariably ones with HSE backgrounds and more sympathetic to the new pro- active approach to risk assessment. Indeed the general reaction of those in the industry, as revealed in the interviews, was that those with the engineering background were 'mediocre' and:

> "had reached the height of their career in the railways and had thus being tempted to join the Inspectorate. Certainly if they were in the private sector, they wouldn't be as easily employed."[360]

Coleman (2000a) again raised the point about limited resources when explaining the reliance on Railtrack officials to scrutinise and effectively pass safety cases for operators. Thus they were hoping by 2001 to recruit 50 Inspectors to assess safety cases and 12 Inspectors to accept Railtrack's decisions on safety cases and any proposed changes to existing ones.

However even with the increase of personnel this is likely to be insufficient and delays in accepting safety cases is likely to continue. This is because even though the HMRI assess cases independently of Railtrack, no formal assessment begins until Railtrack have presented their recommendations. This has the potential for not only duplication of effort but certainly delays the whole process. This led Holden to describe the whole process as 'cumbersome' and 'overly bureaucratic'

Also, despite more staff, the HMRI would still have the equivalent of only 3.5 Inspectors at any one time involved with accepting any changes or proposed changes. Neither is this likely to be helped by the practice of concentrating recruitment from within the HSE. This means that only 20-30% will have experience of the railway industry; whilst only 10-15% will have a

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[359] 'Awkward' in this sense usually meaning an Inspector who had been an ex-railway man as opposed to one recruited from within the HSE.

[360] Again, a private interview, 1999.

passing knowledge of the industry and its complexities. This leaves by HMRI's own projections that over half will have only a generic knowledge of safety cases.

Another more surprising point re-emerged vis a vis safety cases acceptance is that just as with Railtrack, up to 2000 the HMRI did not have any legal sanction to enforce any shortcomings in operators' safety cases.

Approvals Work

The third division of the HMRI is RI1 which inspects and approves new works on the railways and the introduction of new Rail Safety Standards as proposed by Railtrack, (see Chapter 6). This has proved to be one of the most controversial areas of their activity as revealed by the Ladbroke Grove accident. Here again the principal problems are the diffusion and uncertainty of responsibility and the limited resources and a consequent over reliance on the industry to provide the staff to shoulder the burden of implementing any necessary improvement work.

The first area of confusion is the relationship with Railtrack over the introduction and amendment of general principles and guidance for rail operation. Here Coleman admitted that far from being independent and proactive of Railtrack, they routinely used staff seconded from them in drawing up such principles. [361] This degree of reliance also extends to the introduction and amendment of Rail Safety Standards, (RGSs). As outlined above, these are the fundamental standards by which the industry tries to ensure a uniformed approach to operations, and as such form the basis of safety on the system. As with safety case approvals the HMRI has a role, but it is essentially passive in that they don't usually have any hand in the formation of standards but re-act by passing approval/disapproval in them. However, even this role is full of ambiguity. Witness the following exchange between Counsel for the Inquiry and the then Deputy Rail Inspector in charge of the Technical section, Alan Cooksey:

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[361] Coleman, 2000a.

- **Q**: The Railway Inspectorate are consulted, as I understand your evidence, but do not approve Group Standards?
- **Cooksey:** No, we would make our disapproval very clear if we were unhappy. with them, but we do not actually approve them.

- **Q:** If you made such disapproval clear, would Railtrack ever nonetheless go ahead? Do they ever, nonetheless, go ahead and introduce a Group Standard?
- **Cooksey:** I think there have been occasions when they have persuaded us that our disapproval was unjustified. But...
- **Q:** But not in the face of your continued disapproval?
- **Cooksey**: No. But, there again, they are the duty holders. They are their standards, they are not ours.
- **Q:** But I am right to say that the Inspectorate do not have the resources to check and confirm every Railtrack Group Standard?
- **Cooksey**: No. Nor would it be our role to do so.

The exchange admits the possibility that the regulator could be over-ridden and for example, a RGS could be amended without permission. *Something that happened in the case of* RGS GO/OT0013 *and the* Southall Crash, (see above and Appendix 3). In this situation it took the HMRI nine days *after* the crash to reassert the category 'A' status of GO/OT0013.

The next problem lies in the process of how new works and changes to the infrastructure. Here again the issue is one of a lack of resources leading to a situation where approvals are delayed and a backlog emerges. As Cooksey pointed out:

> My resources, particularly on the new works side of the organisation, on the technical side, are very limited.

This chronic issue of under funding coincided with a sharp up turn in passenger volume in the first years of privatisation and an upsurge in new works as the network was extended and upgraded. As Cooksey commented by 1998-1999:

> We were overwhelmed with work. We had gone from 350 maybe 400 active schemes to something in the order of 1,300.

[Cooksey 2000][362]

The main result of this was the creation of a considerable backlog in approvals work, resulting in a situation where not all standards/works were scrutinised thoroughly.

It also meant that works not approved or not meeting the required standards were allowed to operate on the network. There is of course a sensible reason for this as Cooksey commented:

> There are many schemes on an existing railway where to give approval before it was brought into use would mean closing down the railway while the approval process went through. That clearly would not be sensible in societal terms.

[Cooksey 2000]

But with privatisation the system of approval changed, introducing an ambiguity in the approval system which meant that Railtrack could extend the time between provisional and final approval sometimes deliberately. Thus under the 1994 Safety Case Regulation Railtrack could derogate operators from having to conform with rail standards as long as they submitted plans to rectify any deficiencies or short comings in operations or equipment. It also meant that operators could introduce changes, without the regulators' approval.

Because the HMRI had to approve any such works they supported this policy of derogation, as they struggled to keep up with the number of new works and standards. They did this by issuing a so called 'comfort letter' to the operators which allowed them to operate new works, such as signalling systems, before they had been approved. Moreover, this letter wasn't even issued on the results of an inspection of work undertaken but merely on the submission of plans of intention.

> The comfort letter would normally be given on the basis of the initial look at a paper submission, very much as the provisional approval was given. It is the initial assessment of the proposal on paper as to whether in simple terms it makes sense.

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[362] Including major amendments and additions to the network such as the Euro Star service and the Heathrow Express.

[Cooksey 2000]

But under the regulation concerned with approvals - regulation 4:4[363] – didn't specify any time scale within which companies (and Railtrack) had to complete any work that might be needed to be done to bring works up to the HMRI's standards. This meant that they could continue as long as they liked operating or performing below the standard. Again the evidence:

- **Q:** Is there any incentive on the railway company to seek approval if it is able to go on operating using this regulation?

- **Cooksey**: I cannot speak obviously for the railway company. But you could construct a premise that they can leave something in that situation for an indefinite period of time.

In these situations and if the HMRI think that companies are 'procrastinating,[364] their only option is to use its legal powers to impose any changes Rail Inspectors eventually consider necessary. Their enforcement policy is the subject of the next section.

Enforcement policy

The HMRI also has legal powers to issue notices where potentially dangerous procedures, or equipment need to be improved or where there are breaches of legislation and/or rail safety regulations. This is done by three main measures: the Improvement notice; Prohibition Orders and Prosecutions under the HSAW Act. Improvement Notices would be used if for example the Inspector felt that equipment needed to be replaced, or installed. Prohibition orders, where train operations are suspended, are reserved for situations where there is evidence of deficiencies could give rise to a dangerous situation.

Such notices are usually brought by RI3, or the Technical Division. As with the other aspects of the division's work the tendency has been to be

[363] 1994 Safety Case Regulations.

[364] The phrase being taken as policy by Bacon in her witness statement to the Cullen Part 2 Inquiry.

reactive and to regard any legal action as very much the 'last resort' after persuasion and cajoling has failed. Thus Hutter (1997; 2001) found in her studies in the 1980s that the approach was persuasive to say the least thus:

> There is no doubt that this Inspectorate tends to be accommodative rather than sanctioning.
>
> [Hutter 2001:104]

As she further concluded:

> Very serious one-off incidents and blatant offending could prompt legal action but overall the Inspectorate were more concerned with shaping motives and preferences through education and advice than catching out and punishing offenders.
>
> [Hutter 2001: 109]

As such recourse to legal sanctions were regarded as admissions of failure on an individual Inspector's part. This was largely because of the existence of a single unitary body, British Rail and that the Inspectorate was still composed of engineers from the army and the railway industry, (see above). As Hall summed up:

> 'its remit was to investigate accidents and trends, to oversee, gently, any works and to keep ministers informed.'[365]

This was reflected in the statistics on Improvement, Prohibition and Prosecutions in the period. Thus up to the middle of the 1980s there was a marked reluctance to lay such measures. As progress towards privatisation became increasingly evident, both in terms of asset sales and changes to BR's internal organisation, (see Chapter 3), so the sense of a common purpose between Rail employees and the Inspectorate in promoting the Railway culture began to change. This combined with the shift towards recruiting Inspectors with a HSE background meant that the culture began to change towards prosecution. Thus the comparison between the 1980-1993 period and 1994-1998, (see Tables).

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[365] As quoted in Wolmar, 2001 p.105.

Table 5: Enforcement Notices and Prosecutions made by HMRI 1980-1993[366]

Year	Notices			Prosecutions	
	Improvement	*Prohibition*	*total*	*Laid*	*Convictions*
1980	0	0	0	0	0
1981	0	0	0	0	0
1982	0	0	0	0	0
1983	4	0	0	2	2
1984	0	7	7	3	3
1985	1	2	3	10	10
1986	1	1	2	1	1
1987	5	3	8	2	2
1988	7	3	10	4	4
1989	5	4	9	4	3
1990	15	7	22	5	5
1991	23	4	27	5	5
1992	12	5	17	4	4
1993	7	2	9	7	7

Table 5: Legal Action by HMRI 1994/5-1999[367]

Year	Notices			Prosecutions	
	Improvement	*Prohibition*	*total*	*Laid*	*Convictions*
1994	12	3	15	3	3
1995	15	8	23	3	3
1996	20	4	24	6	6
1997	14	19	33	8	8

[366] Annual HMRI reports.

[367] Ibid.

1998	15	6	21	10	10

Thus the post privatisation period shows increasing resort to a more punitive approach. However, the picture is by no means uniform, with for example prosecutions being largely a function on the number of accidents in a given year.[368] As one interviewee stated of the private era: "The inclination was still not to prosecute or use enforcement notices but to seek agreement."[369]

This came about for two main reasons: the lack of resources and the naivety shown by Technical Inspectors. The issue of a lack of resources has already been commented on in relation to the other duties of the HMRI as a whole, and in the Technical Division in particular.

Thus a lack of resources also impacted on enforcement policies as the process of getting enforcement includes the possibility that operators can appeal all three forms of notice. Since this process can last for up to six months, it places placing extra burdens both financially.[370]

In the pre-privatised period the *camaraderie* of the railway culture meant that any decisions made by Inspectors were never challenged. This has changed with the private period, as one Inspector stated:

> We are now increasingly beginning to see challenges. In the past it was rather the case of the Inspector says 'jump' and they (the industry) say 'how high'. Now the question is 'why'.....They are getting more business like and saying 'do we have to spend this money. '[371]

This private view was echoed by the 1997 HMRI's Chief Inspector Annual Report which stated:

> The days when what an Inspector was done regardless of cost are gone. However, such challenges......will continue to put Inspectors on their mettle and will occupy more time and effort to counter them as necessary.

[368] This can be deduced given that there hasn't been an unsuccessful prosecution.

[369] Private interview.

[370] Interview with Coleman, April 2000.

[371] Hutter 2001, p. 271.

[HMRI 1997:13]

Part of this had to do with the view taken by operators that once their safety case had been approved, no necessary improvements needed to be made.

Robertson again:

> Consequently they take umbrage if a field Inspector asks for a situation to be modified to make it less dangerous.[372]

Indeed relations between the Inspectorate and the Industry began to deteriorate in the late 1990s such that challenges were ' seemingly more often designed to justify avoiding additional work rather than supporting the need for it.'[373]

Because of the possibility of getting involved in protracted legal proceedings, the HMRI have become increasingly wary of laying notices at all. As Bacon testified:

> We understand that HMRI has been reluctant to pursue formal enforcement action with the industry if it is believed that objectives might be achieved through co-operation. This arises, in part, from an expectation that Railtrack will challenge formal enforcement and because of the resources implications for HMRI in protracted legal disagreement. The recent Railtrack appeals against the notices served following the Ladbroke Grove are examples of the considerable HMRI resource that can be required for formal enforcement action.

[HSE 2000: para. 64]

But the other element of such reluctance has been the residue of trust the Inspectorate has invested in Railtrack to police the system themselves. Thus Coleman: *I trusted them too much.* [Coleman 2001]. Such naivety was to be the hallmark of the way the Inspectorate dealt with the signalling problems surrounding SN109, the signal that played a decisive part of the Ladbroke Grove accident.

SN109[374]

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[372] HMRI 1997

[373] Ibid.

[374] The signal at the heart of the causation of the Ladbroke Grove crash, October, 1999. For details see Appendix xxxx.

Some of the issues that were illustrated in the way Railtrack dealt Great Western Trains and their management in the years running up to the Southall crash, are similar in the events surrounding the way the signalling system at Ladbroke Grove were handled. These include confusion of responsibilities and the way delays over implementing the schemes were endemic to the process of approving and enforcing improvements to railway works.

The signalling works at Ladbroke Grove were initiated as early as 1991, when the system was still unified and in public ownership, under British Rail. The plans for the new system laid before the HMRI were provisionally approved in 1993, subject to being inspected.[375] This was as normal essentially a paper exercise[376]. In the following twelve months as the scheme was continuing to develop, Railtrack was established as Government Company, still in the public sector. Also the 1994 Regulations surrounding how the approval of works were administered were introduced. This had the effect of enabling Railtrack to operate any amendments to the signalling complex at Ladbroke Grove for an indefinite period until the HMRI had sufficient information to make a judgement as to its compliance with standards, (see above). A decision which was supported and legitimised by a 'comfort letter' from the HMRI. The reason for delays in inspection was as already mentioned the lack of sufficient staff to cope with the explosion of approval work. In fact it took until nearly two years after the initial provisional approval for an inspection to take place, and only then at the HMRI's insistence.[377]When it was finally examined it wasn't examined thoroughly and followed the usual practice of 'sampling' of works. As the subsequent Internal inquiry report confirmed that it was:

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[375] 26/02/93.

[376] As Cooksey stated: "We made, in granting provisional approval, an assessment of a paper design." 14/07/2000.

[377] In fact it was only because the head of the HMRI's RI3, who was a commuter using Paddington station, noticed that the system was near completion. Even then it took Railtrack a further two months to agree to an inspection, on 31/01/95- 2/02/95.

'essentially a sampling process of the built installation to confirm so far is possible that standards have been complied with along with the quality and sustainability of the equipment'

[HSE 2000].

Even so, the inspection revealed serious problems and that the area was in effect a 'black spot' in terms of SPADs, with 31 occurring in the newly signalled area in 1993 and 1994. Moreover, the situation was deteriorating with over a quarter of them occurring in the final quarter of 1994. The February 1995 inspection raised 27 specific points that the HMRI felt needed addressing; not least the high number of SPADs and the probable cause being problems of drivers failing to see red signals at SN109. These were raised with Railtrack on March 1st, 1995 – although on the same day another letter was sent assuring that on the balance of a QRA exercise it was still alright for Railtrack to continue to operate the system under Regulation 4: 4. As Cooksey wrote:

though having raised the concerns, they are not the level where we would have deemed it necessary to stop Paddington station.

[Cooksey: 2000].

Further they had concluded that the follow up work on the erection of electrification equipment connected with the new Heathrow Express scheme could be approved under the regulations even though it would involve potential sighting problems for drivers. In 1996, now nearly two years after the original inspection, the Rail Inspectors had not only not judged the compliance of the scheme but added the issue of sighting arrangements on the list to be considered.

All these actions by the HMRI were based on the assumption that Railtrack had undertaken a risk assessment on the system. Nevertheless, when it was discovered that this hadn't been done, the Technical Division felt that the fall in the number of SPADs in the area was sufficient evidence not to insist that such an assessment be done. [378] in return, Railtrack promised to undertake a full audit on SPADs in the 'throat', as the signalling system in that

[378] As the HSE 2000 report stated: We could find no evidence that the Technical Division subsequently pursued the issue of risk assessment in the phase." Para. 44.

area was called. This was expected in early 1999, but was only finished in September 1999. Cooksey had decided to delay any final approval until the findings of the 1997 Southall Crash had been published. This Inquiry didn't start until September 1999. By the time of the Ladbroke Grove crash in October 1999, a signalling system that had been in operation, (or partial operation) since 1994 and had been first inspected in January 1995 had still not been approved and had been allowed to continue to operate. As the HSE concluded with somewhat restraint:

> "In relation to HMRI's history of involvement in the circumstances leading up to the Ladbroke Grove accident, we queried whether the approval process for phase 1 of the signalling scheme was operated with sufficient urgency."
>
> [HSE 2000: *para*, 52]

This negligence was to have fatal results in October 1999 and was based on assessing SPADs in terms of numbers instead of the potential consequences of individual incidents. Such an approach was to characterise the attention paid to what proved to be the cause of the Ladbroke Grove crash itself, Signal SN 109.

SN 109

> SPAD classification by both Railtrack and HMRI was inappropriate because it was based on outcome rather than potential. There should have been a more systematic intelligence collection by HMRI on the underlying causes of SPADs with serious potential. This has led to insufficient priority being given to the major hazard potential of SPADs and, in particular, signals at which multiple SPADs have occurred.
>
> [Coleman 2000a].

Bent, twisted metal deluges the remains,

Of the soot-caked furnace that cremated the unlucky.

The work-goers lie as dust beneath relatives' feet

Unable to answer their ever calling mobiles

that remain ringing in the survivors ears.

Images of death and pain, swamp the shocked minds,

As the reality seeps deep into the weeping scars

That the survivers will never be able to heal.

The sea of flowers wilt for the loved ones

That may never be found in the twisted urn.

[Fiona Macro][379]

Signal SN 109 was the primary cause of the Ladbroke Grove crash that claimed 31 lives in October 1999, (see Appendix 3). Specifically, a Thames Train left Paddington Station at 08:06 bound for Bedwyn in Wiltshire, passed SN109 at red. This directed the train towards the same Up Main line as that being used by a Great Western Trains, High Speed Train as it approached Paddington. The two trains collided at a combined speed estimated at 130 mph, killing 31 people and injuring 160.

But this wasn't the first example of problems with SN109 and during the 1990s it acquired a notorious reputation as being one of the sites with the most frequent SPADs on the network. In fact it was the fifteenth worst in the UK, with 8 SPADs in five years. Of these seven involved misreading, or mis-interpretation of signals, including the most 'hazardous' in 1998[380]. How this was managed spoke not only of an Inspectorate out of touch, but of an industry filled with mistrust.

As already mentioned the HMRI were aware of the problems connected with the 'Paddington throat' or the signal network in the vacinity of the station. They were also aware that a key issue was sighting problems with several signals, due to their positioning in relation to bridges and gantries. However, the approach was to judge incidents in terms of the degree of severity as measured by the distance by which trains involved exceeded, or over ran, the signals passed. Additionally some notion of hazard was inputted. On this basis this is how the SPADs were assessed thus.

Table 6: SPADs at SN109 1993-1998[381]

Date	Severity	Error category	Hazard

[379] "SN109" poem by Survivor of the Ladbroke Grove Crash.

[380] As defined by HMRI.

[381] Internal Inquiry Report, HSE 2000 para 59.

	category		category
22 August 1998	1	Failure to react correctly to signal	1Ac
6 August 1998	1	Failure to react correctly to signal	1Ac
4 February 1998	3	Failure to locate signal	1Bb
3 April 1997	2	Viewed correct signal misread aspect	2Bc
23 June 1996	1	Failure to react correctly to caution signal	1Bc
15 March 1996	2	Failure to check signal aspect	3Cb
13 February 1995	2	Misread/viewed wrong signal	1Cb
2 August 1993	1	Misjudged train behaviour	--

The Categories for severity was 1-8, with 4-8 being regarded as 'serious' over runs, with the degree of 'hazard' being 1 equalling 'serious'. Thus whilst it was recognised that the potential of most of the incidents was serious, the emphasis was on what actually happened in terms of trains over running signals. In these terms, whilst the HMRI were aware of the problem with SPADs at SN109, they were prepared to let Railtrack get on with it.[382] However, Railtrack were far from getting on with it and serious organisational faults were hampering progress.

The degree of confusion and delay can be illustrated by their reaction to the February 1998 incident, one of the most serious before the fatal incident on 11th October 1999.

The February '98 incident involved a Great Western Train over running by 432 yards, but again it was concluded that the possibility of a collision with another train was unlikely. Moreover the driver admitted that he was to some extent at fault. Even so the internal inquiry asserted that the sighting of SN 109 needed to reviewed.[383] This was supported by a separate representation from GWT drivers who said that drivers had to count the number of lines to be sure that they were looking at the right signal when approaching them. Meanwhile the HMRI had sent two Rail Inspectors from the RI3 division concerned with accident investigations pointed again to the problems with SN109 and recommended an enforcement notice be laid to amend the system. This was rejected by the RI1 Technical Division on the basis that there wasn't sufficient evidence to do so and that any changes would take several months of disruption in the area. Part of this conclusion was based on

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[382] Cooksey, 2000.

[383] Cullen Inquiry into Ladbroke Grove, Part 1 2001 Appendix 2, para 14.

the assumption that Railtrack would make an internal risk assessment as recommended by the Internal Inquiry. In fact this didn't take place as Railtrack personnel weren't sure whose responsibility it was. One of the signs of this was the abandonment of Signal Sighting Committees which were routine under British Rail when SPADs occurred. Cullen was to conclude on this that:

> The failure to have signal sighting committees convened was persistent and serious...and was due to a combination of incompetent management and inadequate process.

Wolmar (2001) sees this as a fatal error in terms of what happened at Ladbroke Grove[384]. What it does do is to illustrate the internal confusion in Railtrack's management. As Cullen concluded on how some of the recommendations on SN109 were managed:

> None of these recommendations was implemented...Recommendations 3, 5 and 6 were allocated to Mr Wiseman. He was unaware of this fact until 18 months, apparently as a result of the failure of Mr Sutton to notify him. Recommendations 4 and 7 were allocated to Mr Wilkinson. It appears nothing was done. He said in evidence that they were referred to Headquarters. He was not aware how either recommendation on the layout risk model was progressing at the time when he left in September 1998.
>
> [Cullen 2001: para. 7.98][385]

Such confusion and inaction was also evident in Railtrack's relationships with GWT, the operating company involved in the SPAD. The mechanism for communicating between was the Safety Management Group which met every two months. This was the conduit for discussion on how to take any work on SN 109 forward, being composed of Wilkinson as Chairman, representatives of Railtrack and GWT and drivers' experts. The reality was a lack of

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[384] Wolmar, p.143.

[385] PW Wiseman, Business Development Manager, Railtrack, Great Western Zone.

R L Wilkinson, Production Manager, Great Western Zone

M. Sutton, Performance Services Manager, Great Western Zone./

communication and activity. Alison Forster of GWT, [386]charted the progress of these meetings and it didn't get off to a good start:

> I think it functioned.......it functioned very badly at the start of these meetings. There was no follow through of actions. There was no action list.

This started to change and action lists were produced for work to proceed. Nonetheless, 10 months later and one more SPAD later[387], (and several letters and memos) she was moved to write on December 22nd 1998:

> "It is clear from all the SPADs in the Paddington area that there is a serious problem with drivers misreading signals. This has been known for sometime. Very little action had been taken by Railtrack to date. It is quite clear that actions were given to people and then it was not ensured that they carried on."

[Forster 2000]

The most that Railtrack had done was to propose that a special internal committee be created to examine the whole issue. This eventually met on January 15th 1999, but only another SPAD had occurred at the nearby signal SN63. This meeting committed Railtrack to a number of measures including a risk assessment of the site and the possible increased installation of Advanced Warning Systems, AWS' to prevent SPADs.[388] These matters were confirmed at the next Safety Management Group meeting in February. But even as late as May 1999 the internal committee had yet to lay plans for implementing these changes. Forster was becoming increasingly concerned and frustrated not only about the delays but that Railtrack weren't considering the wider implications of their proposals and the need to consult other operators and specifically Thames Trains. This was particularly pertinent in that previous SPADs at SN 109 had involved Thames Trains' drivers. (It was of course a Thames Train driver, Andrew Hodder, who was to make the fateful mistake at SN109 that led to the Ladbroke Grove crash). As she wrote in June:

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[386] Operations and Safety Manager, First Great Western.

[387] August 1998, see Table above.

[388] For details of AWS see Appendix 4

"I remain seriously concerned that after all this time and a number of meetings to discuss SPAD mitigation methods that I am being asked to consider a solution to the problem in isolation and as a result of an event/events. If we carry on in this way we will continue to solve one problem but its solution will create another hazard. This is clearly not the manner in which to manage risk."

Railtrack did not reply to this letter . In September, 1999 she took her concerns to the HMRI. The response was characteristic of their overall approach, (see above). Thus Forster again:

They took that (her views) away. They did not give me a response. They listened to our concerns and took that information away with them.

That was the first week of September, two weeks later the Southall Inquiry began and the HMRI decided to suspend any judgement on the signal system pending any recommendations that may arise. Two weeks into the Inquiry, the Ladbroke Grove crash occurred. Nothing had been done by Railtrack to address the concerns of a SPAD that had occurred 18 months earlier. The HMRI had still not approved a system that had been proposed in 1993 and that they had first inspected in 1994. It was only after the Ladbroke Grove crash that the HMRI imposed an enforcement order on the system.

The incident at SN 109 revealed a great deal about how the old engineering, or railway culture of safety had been replaced with one based on QRA exercises that were supposed to underpin decisions made by Railtrack and the HMRI. The close association between the inspectors and the inspected in the pre- privatisated era, had been replaced by a different but in some ways equally close, or dependent relationship in the years following 1993. But despite this and the change in how Inspectors were recruited, the old feeling of a Railway *camaraderie* between the regulated and the regulated lingered on – at least as far as the HMRI were concerned. This was no more evident than in the way the HMRI took things on trust, as Bacon commented:

it appears to me that there was an awful lot that we took on trust that were simply not happening and I think I can understand why our Inspectors did not pursue matters.

More damningly after attending the Part 1 of the Inquiry and speaking to Inspectors who had testified she commented:

> People that I have spoken to who have been listening to witness evidence and have read transcripts I think have been quite shocked is not too strong a word at the degree to which they think that to some extent have had wool pulled over their eyes or have simply not been kept in touch. On one or two occasions it is wool pulled over eyes, more generally it is not being touch with what has been going on with thinking in the industry.

Coleman at a conference of Railway industrialists in July 2001 echoed her sentiments when he admitted of his relationship to Railtrack and the TOCs that: "I trusted them too much."[389]

SN109: Postscript

In the wake of the Ladbroke Grove crash, the HMRI placed a prohibition order on the use of the signals complex containing SN109. Between 1999-2002 all other signals in the 'throat' were fitted with Train Protection Warning System, (TPWS), designed to stop all trains passing a signal at danger at speeds up to 75mph.

It was to take until April 2002 for Railtrack to produce plans for the re-introduction of SN109. The scheme was estimated to cost £29m and involved lowering SN109 by 2' 6", giving drivers 15 seconds sight warning instead of the usual 7 seconds. However as of April 2002, these plans had not been finalised, or approved. As Haigh pointed out in *Rail News*:

> No date has been set or the changes and Railtrack has still to present the safety case to Her Majesty's Rail Inspectorate.[390]

Meanwhile the HMRI has extended the time given to Railtrack to implement the scheme. Despite Coleman's reaction ten months earlier that such delays were placing Railtrack and others beyond the 'last chance saloon'.[391]

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389 Speech at IEE Conference. 'The Future of the UK Railways' June 26th, 2001.

390 Philip Haigh, 'Paddington signals to change' *Rail News*. 432, April, 3rd 2002.

391 Specifically "there's a phrase about drinking in the last chance saloon- these people are beyond that now, they are on the last dregs before they are chucked out." Speech at IEE Conference. 'The Future of the UK Railways' June 26th, 2001.

In March 2002, the Crown Prosecution Service advised the British Transport Police that a criminal prosecution against Railtrack for Corporate Manslaughter wouldn't succeed, but that the HMRI were looking at a civil action based on breaches of the HASWA. [392] The irony is that as of July 2002, the HMRI as the regulators are themselves under threat of civil action because of their role in the delays to the resolution of SN109.[393]

Thus far the Chapter has discussed the role of the Industry's safety regulator and has established that there are organisational shortcomings such that the safety cascade system as presently regulated is inadequate. However, all such safety arrangements should be viewed in the context of the wider open system that is the privatised system. This is the subject of the final sections which will discuss the ways in which the industry is held together by contractual arrangements, and how this has impacted on safety, and how the contract culture has influenced attitudes to safety. As part of this there will also be discussion of the influence of the economic regulator, the Rail Regulator.

The Contract Culture: the cancer at the innards

turning and turning in the widening gyre

the falcon cannot hear the falconer;

things fall apart; the centre cannot hold,

Mere anarchy is loosed on the world,

[392] As they concluded: There is no doubt, in our view, that the evidence in this case clearly reveals a history of corporate failings. However, given the principles of law which we must apply, we concluded in May 2000 that the evidence was not sufficient to enable us to prosecute any person or company for manslaughter by gross negligence and there is now no basis upon which a further investigation by BTP could be justified. CPS press release 22/03/02.

[393] From Thames Trains. As Judge Morland remarked: "the alleged close involvement in and knowledge of the dangerous situation at Ladbroke Grove junction with inaction over a period of three years means that I am not satisfied that the victims of the disaster would not have had a realistic prospect of success if they had sued the HSE." Ananova news agency, 23/07/2002.

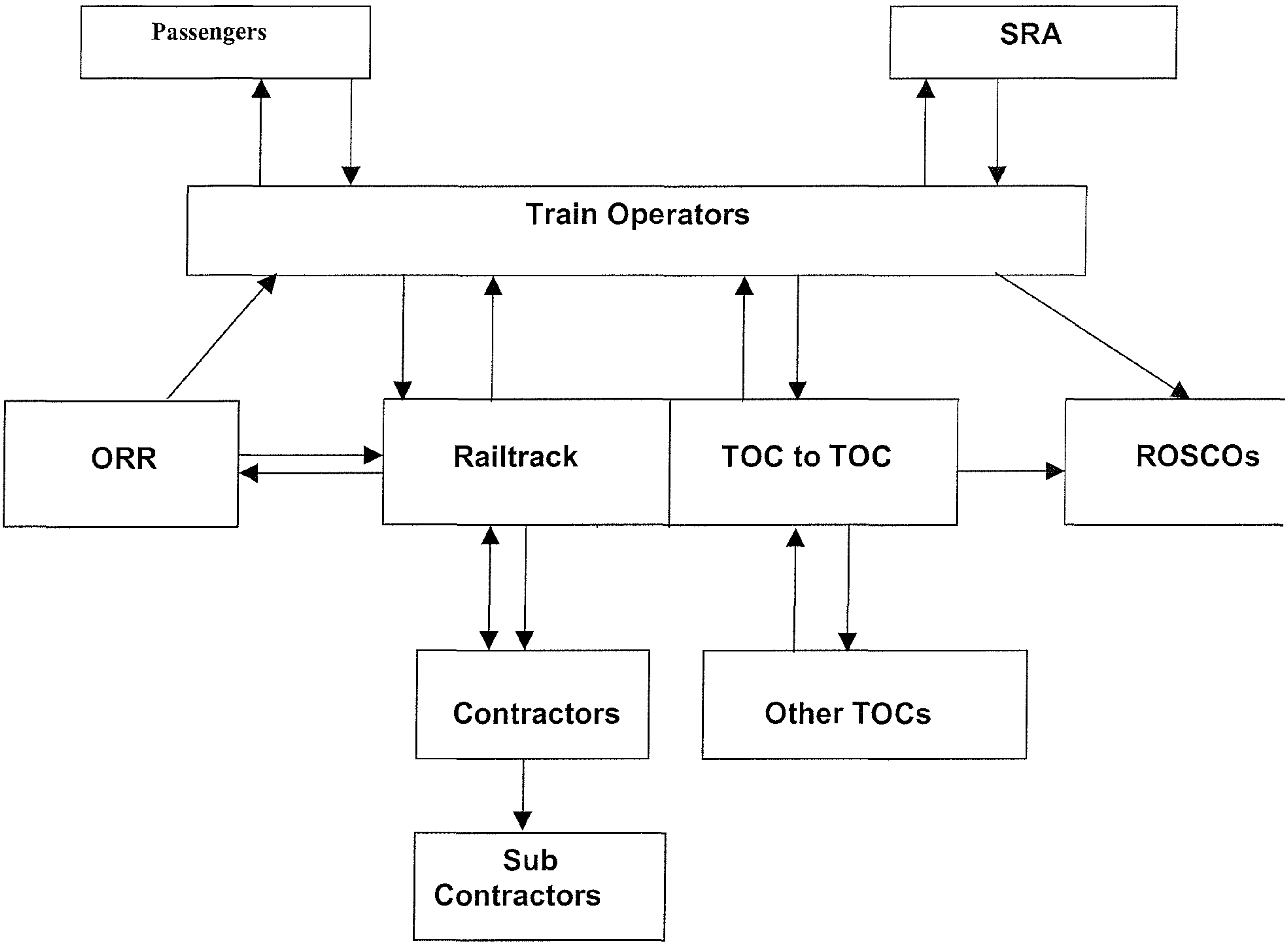
[W.B.Yeats]

Our system has a cancer at the innards at the interface between Railtrack and its' *maintenance contractors.*

[Alistair Morton , 2001]

As outlined in Chapter 3, the most radical aspect of privatisation was its fragmentation and the introduction into the system of contractual arrangements. This produced a contractual matrix thus:

Figure 9: Contractual Relationships*



As figure 5: Chapter 3.

As Chapter 3 outlined, the chief element of the 1993 Act was to contract out services to private companies, giving them the right to operate train services on the network. This was to be done by creating and awarding franchises to run services for a specified area and over a specified length of time. These were awarded by a new regulatory body, the 'Office of Passenger Rail Franchising' (OPRAF)[394].

[394] After 2000, OPRAF's role were taken over by the SRA.

Chapter 3 also described the regulatory framework upon which the new system was to be based. This was primarily one based on contracts between the constituent parts of the industry. in terms of safety, the chief issue has been the conflict between the commercial pressures introduced by such arrangements and the need to provide a safe rail system. The following sections will discuss this in terms of Railtrack's relationships with its Regulator, the ORR, and with its contractors.

Safety v Performance

Clearly commercial aspects are integral to a successful functioning of any business and I think that these are clearly issues which will always be examined because they do bear on what is or is not reasonably practicable under the law to some degree.

[Coleman 2000b]

The noise about performance drowned out the noise about safety.

[Dupont 2000].

The contract culture which defines and underpins the relationships between the various organisations has the potential to create a conflict between the imperative for them to reach performance targets on the one hand, and the aim to operate safely on the other. This has been a constant theme from the earliest days of the privatised industry and indeed was the main reason for the change to the safety cascade and case system in the first place, (see chapter 4).

This view hasn't been one shared by successive Rail Regulators and the current one in particular.[395] In this they have echoed the notion outlined by High Reliability Theorists, that an efficient organisation is by definition a safe organisation. However, in an industry based on a complex series of contracts filled with clauses that penalise under performance that is the rail industry, there is substantial evidence that no matter how efficient the organisation, the accent has been on achieving levels of performance in order to avoid penalties. This has been on a number of levels: the relationship between the

[395] See for example the evidence of the current (2002), Rail Regulator, Tom Winsor, appointed in 1999, to the Cullen Part 2, Inquiry.

regulators and the regulated, including the Rail Regulator and the Stragetic Rail Authority, and Railtrack with its Contractors.

Railtrack and the Regulator

> I am not going to knock Railtrack, but I am going to knock it into shape.
>
> [Winsor 1999][396]

> I do not believe they would ever deliberately, under any circumstances, do something that would compromise safety. However, if there is a general atmosphere that says delay must be avoided at all cost, clearly there is a risk that people may not err on the side of safety in the way they might have in the past.
>
> [Muttram 2000]

> his (the Rail Regulator) refusal to compromise and his crushing performance targets had the industry running in all directions, trying to keep the plates spinning. More dangerously it skewed the industry's sense of what was important.
>
> [Harris 2001]

The relationship between Railtrack and the ORR can be characterised as a confrontational one, especially since the appointment of Chris Bolt in 1997 and the present Regulator, Tom Winsor in 1999[397]. Bolt in particular pointed to the poor performance by Railtrack in the period, 1994-1999, especially in relation to train delays. Thus between 1995-1999 delays caused by Railtrack amounted on average to 7 million minutes a year. [398] The reaction was to impose on Railtrack a target of a 7.5 % reduction in such delays in 1998-1999 and 1999 –2000, with targets of a further reduction of 5% in 2000-2001, and 2.5 % in succeeding years, 2001-2 to 2006.[399] Additionally, Winsor demanded efficiency savings from Railtrack of 4.2% p.a. from 2000 onwards. This approach was summarised by Winsor shortly after his appointment:

> I want to ensure that Railtrack's network licence is fit for purpose. The current licence is little changed from the one issued to Railtrack as a public sector track authority, in 1994. Post Privatisation, I believe the public interest will require stronger protections.......I intend to

[396] Quoted in *Rail*, 438, June 2002.

[397] As of 2002.

[398] 'Ensuring that Railtrack Maintain and Renew the Railway Network', p. 28. ORR

[399] Ibid. p.32.

deliver the tougher and more effective regulation John Prescott[400] asked me to put into effect....Toughness is a means to an end.

[Winsor 1999]

The principal issues that concerned Winsor was to hold Railtrack in particular to closer account as to how they spent public money on maintaining the infrastructure and the level of access charges they could levy on TOCs. Integral to this was an increased concern that performance targets were met, with a mixture of incentive payments for reaching targets, and penalties if Railtrack failed to meet them. This new, tougher approach brought to the fore the importance of performance measures.

The potential effect of this increased emphasis on performance on safety should have been considered by the ORR referring to the HSE. Whether they did so *before* imposing the targets is or a source of controversy and according to Muttram they didn't:

I think I did question the HSE when the Regulator issued his enforcement order on punctuality targets and the HSE told me at that time they had not been consulted before that enforcement order was issued.

This points to a confusion between the ORR and the HMRI over where responsibility for safety on the railways lies. Thus one of the duties of the ORR is to pay regard to the safety of passengers:

to take into account the need to protect all persons from dangers arising from the operation of railways, in particular, taking account of any advice given him in that behalf by the Health and Safety Executive.

But it doesn't define when advice should be sought and whether it should be attended to. Whatever, the effect of stressing performance has been to focus the industry on performance, rather than safety. Thus Corbett (2000) talked about the "quite colossal" pressures from the Regulator to achieve targets. [401] As he stated:

[400] The then Secretary of State for DELTR, which included the Transport Ministry.

[401] November 11th, 2000.

The noise, the demands around performance were quite colossal. It was quite clear that this was the Government's main objective and that is what everyone thought the passengers wanted, a big focus on train performance.

[Corbett 2000]

He pushed this further, making the connection between safety and performance:

I think it is harder to balance the safety performance equation if you have a set of external pressures on you that are focusing on one particular bit of it.

[Corbett 2000a: q. 59]

Corbett revealed the underlying pressure more starkly when he spoke again that month:

Let us escape from the vicious circle of fear, fear of missing a short-term target, fear of fines, fear of being briefed against. Let us look our regulators in the eye.[402]

Of course all of this could have been dismissed as special pleading on Railtrack's part. In any case, these comments should be seen in the context of the fractious relations that existed between Railtrack and the Regulator in the run up to the review of access charges that went on between 1999 and 2000. Thus Wolmar characterised relations between them in the period as 'a permanent state of war', with 'regular, acrimonious exchanges between Corbett and Winsor in the press over regulatory review.' [403] *Modern Railways* described the two protagonists as 'Tom (*Winsor*) and Gerry (*Corbett*) – irresistible force meets immovable object.'[404]

Thus at the Cullen Inquiry Winsor mounted a consistent defence of his actions over the period, pointing out that between 1999 and 2000, he had only imposed one financial penalty on Railtrack, because of a failure to meet passenger performance targets by 'a large margin.' Further, If there was any

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[402] *Modern Railways*, November 2000. p. 27. Winsor dismissed this statement as 'nonsense' and 'froth'.

[403] Thus Wolmar (2001), p. 204.

[404] [404] *Modern Railways*, November 2000. p. 26.

dilemma between safety and avoiding penalties it wasn't down to him but Railtrack management's inability to reconcile the two apparent opposites. As he stated:

> If Railtrack is a competent and efficient company, managed well, then there will be no conflict between safety and performance because they are two sides of the same coin… a punctual rail service is a safe one.
>
> [Winsor 2000].

However, this view doesn't take into account that the review of licensing conditions for Railtrack changed in 1999, with incentives being doubled for reaching targets, or penalties per percentage point they failed to meet targets.[405] In 1999 this amounted to a £10m fine levied by Winsor on Railtrack. It also ignores the ability of the ORR to impose these fines directly and immediately unlike the HMRI, who have to serve a series of enforcement orders and face the possibility of being challenged in the courts, (see above). In this respect Winsor pointed out the possibility of the HMRI launching criminal proceedings, which had the potential for imprisonment. But again in the context of the difficulties encountered when Great Western Trains were prosecuted over the Southall crash (see conclusion) this seems a somewhat irrelevant point. As Harris pointed out:

> When Mr Winsor levied the biggest fine in corporate history - £10m – on Railtrack for poor timekeeping, it was impossible not to make judgements about the much smaller £1.5m fine on Great Western Trains for safety offences leading to seven deaths at Southall. What was more important: timekeeping or safety?
>
> [Harris 2001]

But over and above all this, the ORR's actions has attracted criticism from across the industry, and not just Railtrack. Thus the HMRI expressed their reservations about the possible conflict with safety arising out of imposing economic pressures:

> ORR's proposal was to increase the amount of money in play for items such as train performance. They were minded to double the incentive rates for items where there was a clear societal benefit. However, this was an area that needed to be trod carefully as there was a danger that safety could be compromised if there was too much concentration on incentives.
>
> [HMRI 1999].

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[405] Of between £3-4m per percentage point.

The Rail Unions also objected - again on the grounds of safety being compromised:

> "The Unions are most concerned that in practice the decisions of the Rail Regulator are having a very negative impact upon safety. In concentrating on performance there is a risk that it is put before safety. The simple fact is that by the imposition of fines and the requirement of better performance the Rail Regulator is, through the operators, requiring staff to work in unsafe conditions. That is, his decisions are having a direct impact on safety although they are not in fact safety decisions."
>
> [RMT 2000].

They also pointed to the potential conflict in two of the ORR's objectives: reducing train delays and the need to replace and renew the track.

> It is extremely difficult to run a comprehensive timetable with no delay and at the same time to seek to undertake considerable remedial work to infrastructure in safety. The Unions have great concern that the Rail Regulator's decisions are not sufficiently safety sensitive.

The Dupont [406]report sponsored by Railtrack investigated this for the concluding:

> The pre-eminent culture within the rail industry in the UK is one of focus on train performance in terms of delays. From our observations and interviews it became clear to Dupont that safety is sometimes subjugated to performance. The dominant figure of the Rail Regulator frequently reinforces the drive for train performance improvement.

This report interviewed was not only the result of interviewing senior figures in the industry but also personnel from selected Train Operating Companies. Although sponsored by Railtrack, it was critical of its safety strategy and its implementation. However, it also revealed the effect on staff of the Rail Regulator's tough approach. The overall conclusion wasn't so much that the Rail Regulator's stance had directly contributed to a downgrading of considerations on safety, but that he influenced perceptions vis a vis operational and safety priorities.

> I am distinctly of the opinion, although it is not true for every case and every person and every moment, that there were significant moments in certain sectors of the industry, Railtrack particularly, where the impacts of the Rail Regulator was interpreted, rightly or wrongly, as being so overwhelmingly driving every element of the operation that people came to that type of conclusion and we came to that type of conclusion.
>
> [Kooger 2000]

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[406] Dupont Safety Resources.

Although the ORR's priorities clearly had an effect:

> I think they (*managers at Railtrack),* gave the impression that the Regulator was not willing to listen to any argument as to why a train was late, even if that involved some safety-related element. In the discussions that I have had with a number of people around the subject of the influence of, we will call it the pressure by the Rail Regulator, I do not particularly have the impression that the Rail Regulator was, I cannot say not concerned about safety, but was not expressing a reservation about safety.

The Dupont report concentrated on the pressures inherent in the role of the economic regulator, but their conclusions were echoed by a public seminar on employee perspectives, held by the Inquiry. This included evidence from employees from across the industry and covered the other element of the contract culture: the fault attribution system at the heart of the relationships between the constituent parts of the industry (see above).

Public seminar No 4

The Public Seminar held on 18th October 2000, was part of a series held by the Cullen Inquiry to complement the main hearings and was concerned with rail employees' perspectives on safety, (see Appendix 2). A number of issues were discussed that taken together attempted to construct a picture of attitudes towards safety and how working practices based on meeting performance targets affected them.

The first point to emerge was the affect privatisation had on creating divisions between what were seen under BR as comrades with a single purpose. Thus for example, drivers and signalmen now worked for different organisations who were related by contractual terms, (see above), each with different priorities and aims as they seek to meet performance targets. This has created a situation characterised by one participant A, as: "the big BR family are in different houses not talking to each other." [407] Participant B pointed to the new culture:

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[407] Participant, A. A railway expert.

British Rail had a safety culture which meant that everyone would turn out and deal with problems.. when there was a technical problem, you could phone anyone for advice - Not any longer as this is now involves divulging sensitive financial information.[408]

Or as the secretariat concluded: "No one is encouraged to discuss someone else's problem, or volunteers or shares information."[409] This wasn't helped by another consequence of the contract system; the development of a blame culture between the organisations. One of the participants stressed that there had always been a blame culture in the industry, going back '150 years'.

Performance indicators were an issue in the latter years of British Rail, with for example initiatives such as the passengers' charter, but the crucial difference the participants identified was that unlike British Rail, delays had direct financial consequences. As Participant C stated:

Yes delays have been an issue but now due to privatisation delays have financial implications for companies and shareholders, as opposed to a general pot under BRB. It has to be off-loaded as a cost somewhere else. A delayed minute is a £ sign."[410]

But the existence of performance targets has infected organisations across all aspects of the industry's operations. Thus participant D, a senior signalman with Railtrack, with 28 years experience noted the change from the days of BR:

"Railtrack is performance oriented and safety has been put behind." And :

"The company's management structure was created to deal with financial penalties." With the result that signallers were constantly reminded of the financial imperatives. The emphasis on avoiding penalties has led to situations where failures in equipment on the line, that in the days of BR would have caused a line closure, are now left as train operations continued. He also speculated that whilst experienced employees would be resistant to doing things that had a potential adverse effect on safety, he wasn't so confident that new, less experienced staff wouldn't undertake such operations.

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408 Participant, B. A senior figure in the Construction Industry, working for a leading Rail Contractor.

409 See report of the seminar Ladbroke Grove Inquiry website, www.lgri.org.uk.

410 Anon manager from a TOC.

This view was echoed by all the participants at the seminar firm across the industry. Thus drivers working for TOCs pointed to the same pressured environment, with drivers who are late being asked to explain themselves. Thus Participant E:

> There are constant pressures with drivers being given delay slips, which can be used by the Companies as part of possible disciplinary measures.[411]

This led drivers to avoid defensive driving as they strive to be on time. Not that such questioning didn't go on under British Rail, but the cumulative pressures of several organisations being involved in apportioning blame has exacerbated the situation. Thus participant F:

> Such discussions have been there for a long time under successive forms that the railway have changed into questioning staff about delays isn't new and existed under British Rail. In the 1980s, Southern Rail had a ruthless system for allocating responsibility over delays. But the build up of the above issues has led to an unease from the operators.[412]

Such concerns over performance permeated down to the contractors. Thus participant G, a manager in a major contracting firm:

> Fines from regulators trickle down to penalties for contractors and therefore they make savings in terms of manpower.

From another contractor:

> They try to work to the rules, but this makes them uncompetitive. This leads to pressures to break rules, which leads to unsafe working.

And another:

> The reduction in manpower leads to constant pressures to meet Performance Indicators. They're trying to do a job that hasn't been planned properly, as they are asked to do jobs at a minute's notice in order for Railtrack to meet PIs.

This section has outlined how the economic regulator, the Rail Regulator, and his actions have impacted on how safety has been regarded throughout the industry. Overall this has been to strengthen the already existing pressures caused by the decision to base the relations between organisations in post privatised industry in terms of contracts and by having to be financially accountable to an outside bodies such as the SRA and the ORR.

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[411] RMT representative.

[412] Railway Industry Association representative.

Chapters 6 and 7 have discussed the dimensions of the open system that has characterised the privatised rail industry and how it has compromised the notions of the safety case and QRA approach to risk management in the system. The final dimension to this system is the way the maintenance and renewal of the infrastructure has been sub contracted to literally thousands of organisations.

Contractors and Safety

> In contracting out for infrastructure maintenance and renewal no relaxation of health and safety issues will be permitted compared to Railtrack's own standards and procedures.
>
> [Railtrack 1994]

> The system of managing contractors who carry out maintenance and renewal work on the railway through the system of 'cascaded safety cases' has been shown to have utterly failed. It is not just the system that has failed: Railtrack's management of its contractors has been woeful.
>
> [Select committee 2001]

> 100,000 contractor's staff are employed or sponsored by 2,000 companies. It makes safety regulation and awareness extremely difficult for everyone.
>
> [Wheeler 2000]

> The company's failure to manage the arrangements properly led to people who were not competent being expected to do jobs they were not able to properly discharge. But for good fortune, this case could have involved a serious injury or fatality.
>
> [HSE 2002][413]

The most obvious manifestation of the complex system is the proliferation of companies involved in the maintenance and renewal of the infrastructure.[414] At the top end of the contractual system both aspects have

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[413] HSE Press Release E042-02 4/03/02: Report of successful prosecution by HSE of Javis Facilialties Ltd.

[414] The difference being that whereas maintenance contracts are designed to preserve the standards of existing track and signaling, renewals are concerned with their replacement as necessary.

largely involved the same company groups although different parts or sub companies of them.

Here a number of issues have been identified as militating against the delivery of safety via the safety case, or cascade system on the railways. These include the way Railtrack has managed and audited safety cases; the implications of so many organisations having no safety cases; and the lack of control exercised by Railtrack over such companies, including the use of casual and untrained labour. Associated with these issues has been the type and management of contracts adopted in the system. First, there will be discussion of Railtrack's supervision of the Contractors' safety cases.

Railtrack and its' Contractors: The Safety Case and its Management

Unlike train operations, responsibility for the maintenance and renewal of the infrastructure was left in monopoly hands in the form of Railtrack. However, given that it was intended that Railtrack was to be eventually privatised, (see Chapters 3 and 4), this would have led to the creation of a private monopoly supplier of the infrastructure. To counter some of the potentially undesirable effects of this on competition and efficiency, Railtrack were instructed to contract out the actual maintenance and renewal work to private contracting firms. [415]

Thus as the infrastructure sector was privatised in 1996, the then six major bidders for maintenance contracts were First Engineering; Jarvis; GTRM; AMEY Rail; AMEC Rail; and Balfour Beatty. These were awarded contracts on the basis of the old seven British Rail zones which Railtrack had inherited based on specific geographical areas[416]. These were covered by a total of and which were based on 35 separate contracts Initially at least this

[415] It was also designed to raise money for both Railtrack immediately, see Middleton, (2000)

[416] Thus the Scotland region was awarded to First Engineering; the North West zone to Jarvis; the Midlands region to GTRM; Great Western zone to AMEY Rail; Southern zone to AMEC Rail; East and North Eastern zone to Balfour Beatty.

meant that each company would be responsible for work and sub contracted work done in their own allocated zone. This involved inspecting the railway in their area and if necessary repair the track and signalling etc. In terms of renewals more or less the same company groups are involved in the replacement of assets that reach the 'end of their 'useful life.'[417] Such allocations offered the prospect that some consistency would be maintained from the pre privatised era.

Moreover, again recognising the potential conflict between profit making organisations being responsible for safety critical work, these companies were required to present a safety case covering the same issues as those applicable to the train operating companies and subject to the same auditing procedures by Railtrack. (See Chapters 4, 5 and 6). As they testified to the Select Committee:

> In accepting Core Contractor Safety Cases we concentrate on validating that the contractor's safety management systems are aligned with our own capable of enabling them to effectively manage the risks associated with the activities to be undertaken.
>
> [Railtrack 1998a]

This was the first source of controversy, as it became evident that throughout the 1990s Railtrack failed to audit these cases at all adequately.

Thus as early as 1996 the HMRI decided to investigate how Railtrack managed the safety cases of the six companies. The subsequent report revealed a number of significant shortcomings. Firstly, it found that not all the major contractors had had their safety cases validated by Railtrack – even though they had been awarded commercial contracts to undertake maintenance/ renewal of the network. Of those that had, many were operating in such a way that meant that they failed to comply with Railway Group standards, (RGSs), which are designed to ensure safe operations on the railway and as such are a basic requirement of compliance with Rail

[417] Thus the Scotland is covered by First Engineering and Jarvis Rail Ltd; the North West, Midland, London and North Eastern zones are covered by Jarvis Rail Ltd; the Eastern Region by Centric Ltd and Grant Rail Ltd; the Great Western zone by AMWY; SECOJV; and the Southern zone by Balfour Beatty Renewals Ltd. 6th Report of the Select committee on Environment, Transport and Region Affairs., March 2001.

Safety Cases.[418] When Dupont reported on the same point in a separate investigation for Railtrack in 2000, they estimated that only 60% of contractor's work was in line, or compliant to their own safety case standards.[419]

All this was due to Railtrack's failure to establish adequate central management systems and arrangements for dealing with their contractors. This extended to all aspects of management functions including Policy formation; Organising; Planning; Monitoring; Reviewing and Auditing, both in terms of ensuring commercial performance as well as safety performance.[420] Such were HMRI's concerns over some aspects of management - especially involving the monitoring and auditing of work done – that they were minded to issue improvement notices on them. As they concluded:

> We do not believe that Railtrack can be confident that risks (of accidents) will not increase as the nature of the Rail industry changes, unless it takes urgent steps to strengthen its systems and the way they can be applied.
>
> [HMRI 1996: 6]

In response, Railtrack officials giving evidence to the Select Committee on Transport in the same year recognised the importance of establishing systems which ensured the compliance of safety case procedures. They also conceded that in this respect issues of communication and auditing were central to the process and that their performance in these had been "patchy" [421]. The importance of such shortcomings were illustrated when the same committee focused on the condition of the track in the environs of Euston Station. Railtrack's management of the contractors responsible for the track was the subject of an HMRI investigation in December 1995 after a derailment. This subsequently revealed that the poor condition of the track had been caused by a lack of attention on the part of the contractors. Moreover, this had not been picked up by Railtrack and as such was one of

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[418] For a more detailed discussion of this see Chapter 6.

[419] Kooger, Evidence to Cullen Inquiry, Part 2. December 2000.

[420] HMRI 1996, pp. 6-9

[421] Mellitt, Evidence to the Select committee, 12/6/96, q.541.

the earliest examples of defects of how they managed their contractors.[422] Stan Robertson for the HMRI went further and characterised it as a "breakdown in the safety system involving contractors. "[423]

Corbett admitted the lack of adequate systems at this time in 2000 when he characterised the relationships between Railtrack and contractors in 1997 as follows:

> The contracts were agreed that they would get a lump sum to do that *(and*) that lump sum was based on what they had got under BR. No one was able to answer the question: "Which contractors were doing well, which were not."

This was at the beginning of the commercialised contracting of infrastructure operations and to large extent such contractual arrangements and structures were inherited from BR. However the deficiencies in the management of contractors was to become a perennial issue as shortcomings continued to be exposed. Thus again in 1996/7 the HMRI investigation into a fatal crash at Watford Junction stressed that even though not directly at fault Railtrack should as the Infrastructure Controller:

> take on a pro-active and co-ordinating role so that they can be satisfied that risk is being properly controlled on their infrastructure by the train operators and others
>
> [HSE 1998b]

In the same year the HSE successfully prosecuted Railtrack and two contractors for breaches of the HSAWA following a derailment at Bexley, the previous year. (See Appendix 3). The subsequent report in 1999, pointed again to Railtrack's failure to monitor and review how the contractors were operating. As it stated:

> Railtrack should ensure that they have adequate systems and procedures to identify failures by their contractors to maintain the infrastructure adequately and to ensure these failures are rectified.
>
> [HSE 1999]

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[422] Ibid, q.620. Millet agreed that this had been the case, but tempered this by stressing the neglect by the contractor.

[423] Chief Inspector, HMRI. Evidence to Select Committee, Q. 520 5/6/96.

Of the HMRI Improvement Notice issues in 1996 and designed to force Railtrack to introduce more effective monitoring and auditing systems in reviewing safety performance of contractors, there was little evidence of anything being done. As they commented:

> The HSE investigation found very little evidence of the new standards having been implemented before the accident. Railtrack were unable to produce an audit plan for the 12 months leading up to the accident.
>
> [HMRI 1999]

In the same year another report by the Environment and Transport Select Committee again criticised the on going inadequacy of Railtrack's management systems for ensuring safety in their contractors operations, identifying the twin causes of poor track conditions as inadequate performance by the contractors and inadequate monitoring by Railtrack.[424]

Also in 1999, following the disaster at Ladbroke Grove the HSE ordered another investigation into Railtrack's management systems. This concentrated on their relations with TOCs, (see above and Chapter 6). However this once again pointed to the: "insufficient focus on key safety management system processes" at the heart of Railtrack's management ethos. [425] Additionally, the Cullen reports alluded to the need for change.[426]

In the same year a report on broken rails sponsored by the Office of Rail Regulator, pointed to the lack of knowledge and supervision of the infrastructure by Railtrack, with issues such as the identification and prioritisation of renewals of the track being left largely to the contractors rather than being supervised by Railtrack. [427] Such failings were the principal cause of the crash at Hatfield in October, 2000, where a broken rail caused the derailment of a GNER train causing the death of 5 people (see Appendix 3).

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[424] See for example the evidence of Coleman, 22/7/98 1st Report: Railway Safety, 1998-99 HC 30.

[425] HMRI 2000, para. 48.

[426] Thus the Inquiry into the accident at Ladbroke Grove, para. 9.44.

[427] Sawley and Reiff, 2000.

The subsequent inquiry by the Select Committee again concentrated on Railtrack's ability to manage their relations with contractors, as did yet another inquiry into how Railtrack handled the renewal contractors. Both found continuing weaknesses some six years after the first HMRI Inquiry. Thus at the Hatfield Inquiry, the then Railtrack Chief Executive, Gerald Corbett concluded that the accident had been the result of "either incompetence or a systems failure and that there had been a "massive local failure." Winsor, went further attributing it to:

> Almost certainly a failure in the chain of command, a simple relationship between Railtrack and the organisation engaged to carry out maintenance on that piece of network.
>
> [Winsor 2000][428]

The committee concluded that:

> Whatever else is revealed during the investigation of the Hatfield accident, it is clear that Railtrack's management of Balfour Beatty[429] on the East Coast Line prior to 17 October was totally inadequate.
>
> [Select Committee 2000]

Overall in the period Railtrack's dealings with their contractors was characterised by a combination of a lack of resources and of management systems adequate to managing and supervising safety performance and indeed commercial performance. Nor does there seem to have been any progress of significance, despite the almost annual condemnation from one body or another.

As the Select Committee summed up about the events from 1996 onwards:

> Railtrack has it seems, staggered from one crisis in recent years ....Railtrack should acknowledge that crises are not simply the result of unforeseen outside events such as accidents and 'Local failures', but are indicative of systematic, often repeated failings in the company's management systems and leadership.
>
> [Select Committee 2000][430]

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[428] Tom Winsor, the Rail Regulator 1999 - quoted in 'City likes the Railtrack Grant.' *The Independent*, 23/10/00.

[429] The contracting firm concerned.

[430] Recent Events on the Railways Para 22.

A separate independent report undertaken by Dupont Safety Resources Ltd for Railtrack found that in essence nothing had changed from the situation uncovered by HMRI in 1996.[431]

The next Select Committee inquiry into Rail Investment and Renewals. This was to be similarly damning about Railtrack's ability to manage track renewals. It revealed that the decisions ono which sections of the network shall be renewed were largely left for the contracting firms to prioritise. One of the reasons for this was the fact that so few employees of Railtrack had an engineering background. Such a lack of expertise started at board level, with only 2 out of 13 members having any such background at all by the year 2000. [432] Ford was more damning when he reported the anonymously given views of a senior 'rail insider':

> Taking the last (Conservative) Government's brief to become a commercial company literally, Railtrack has gradually replaced many of its engineers with businessman. The result in the words of one senior industry insider, is that its managers now 'wouldn't know a dodgy track if they fell over it.'
>
> [Ford 2001: 16]

The failure of Railtrack management to oversee operations on the network and the work of the contractors assumed greater importance because of the fragmentation of the Infrastructure industry and the types of contractual arrangements between Railtrack and them. These are the final subjects in the Chapter.

Contractors: Working on the Railways

In eighteen hundred and forty one, me corduroy breeches I put on
me corduroy breeches I put on,
to work upon the railway, the railway

---

[431] Thus Coleman, November 2000, commented that he findings were: "similar in kind to those made of Railtrack in the 1996 Report."

[432] As Railtrack's Chairman Phillip Beck said to the *Independent* on 22/11/00 as he announced the recruitment of engineers to the board: "We felt it was important to strengthen the engineering leadership on the board and put even greater focus upon our relations with our customers."

I'm weary of the railway
Poor Paddy works on the Railway

CHORUS:
I *was wearing corduroy breeches,*
digging ditches,
pulling switches,
dodging hitches,
I was working on the railway

In eighteen hundred and forty two, I found meself a job to do
I went to working with a crew, a workin on the railway.
From Hartlepool I moved to Crewe
Found meself a job to do
Working on the railway.

In eighteen hundred and forty three, I took me shovel across me knee
I went to work for a company, a workin' on the railway.
And went to work for the company
On the Leeds to Selby railway

I was wearing corduroy breeches
Digging ditches, pulling stitches,
Dancing on the line
Still working on the railway

In eighteen hundred and forty-four
I landed on the Liverpool shore
Me belly was empty, me hands were raw
With working on the railway, the railway
I'm sick to my guts of the railway
Poor Paddy works on the railway

[Trad]

The industry believes that all you need is a bloke who knows how to hold a shovel.

[Participant F, Public Seminar, 4 2000].

As outlined above, when the infrastructure maintenance and renewal was privatised, the contracts were allocated on the basis of the old geographical regions that evolved under British Rail and latterly in the period

1993-1996 when Railtrack was a Government company, (see Chapter 3). But such comparative unity became fragmented from the beginning as the big six bid against each other as individual contracts lapsed. This meant that as of 2001, the only zone with one main contractor was Scotland, with all other zones having work shared out between at least two of the big six.

Further, while on the surface six contractors account for maintaining and in large part renewing the system, in reality they subcontract down the chain, so that the total figure of organisations involved is in reality nearer 2,000, with at least 60 recruitment agencies involved officially in supplying contract labour[433]. Hince[434] (2000) estimated that this involved up to 84,000 workers and Wheeler up to 100,000.

Of these workers the vast majority aren't employed directly by the big six, but hired at first, or second hand. Indeed the RMT estimated that of the 84,000 holders of PTSs [435]in 2000, the big six permanently employed only- 15,000 – 19,000. Ford estimated that the lower figure was the more accurate and down from 1993 figure of 34,000 in the final year of British Rail[436]. In the early days of privatisation this created a problem of verification as to whether workers were qualified to do safety critical work. The solution was for the contractors to establish a National Competency Control Agency, (NCCA), who operate an accreditation scheme called the Sentinel scheme. This aimed to register details of workers eligible to work on safety critical work on the network, recording their qualifications and competencies so that Railtrack and the contractors would know what they were capable of doing. But this scheme was flawed in three crucial respects: the eligibility standards; the verification system and the failure to tackle the incidence of the 'nomads'.

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[433] Corbett evidence to Transport Sub- Committee, 15/7/98.

[434] Secretary, RMT union.

[435] Personal Track Safety certificates, and thus eligible to work on the network. See below.

[436] Knapp, J Evidence to Select Committee

Contractor Training

One of the major problems in managing contractors was that there was no proof of the standard to which workers have been trained. This was resolved by the introduction of the Personal Track Safety scheme (PTS). But the basic PTS course lasts only two days, and only provides a basic understanding of safety issues it does not provide training for the work on the track. Thereafter, it is possible for contractors to start work immediately. This was in contrast to the situation under British Rail where employees would be given at least a week's induction on all aspects of the job. [437] BR Employees would then be given a safety ticket which when it expired meant that re-training was necessary. No such re-training is necessary under the Sentinel scheme.

The second problem with the training is that Railtrack don't train trackside workers in-house but leave it to 100 training agencies. These are accredited indirectly by Railtrack via the NCCA. Public Seminar 4 also highlighted the incidences of Railtrack staff themselves being under qualified to assess a worker's ability to handle safety critical work. [438]

The third problem with the Sentinel scheme was the technology used in verifying workers' details Wheeler (2000) pointed to the inadequacy of the scheme in that the magnetic card system, which contained a worker's detail, has insufficient capacity to interrogate the system. Further verification by Railtrack personnel has to be done by the phone and not directly from the trackside.

But the crucial defect of the scheme is that whilst it recorded skills etc., it lacks effective control over how many hours workers work and the existence of the 'nomads', or itinerant workers who routinely travel throughout the UK in search of casual work. This is because the Sentinel certification allows workers to work for up to seven 'sponsors' or contracting employers. In effect this means that a worker can work almost continuously throughout any given

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[437] Participant F, Public Seminar, 18/10/00.

[438] Ibid.

week and in different parts of the UK network. Much in the way that the nineteenth navvies did (see for example Robbins 1962 and the song quoted above). This can be a particular problem when sub contractors seek to poach workers from rivals.

This undermined a key recommendation to emerge from the Hidden Report into the Clapham Rail crash of 1987 that there should be a limit of work periods or shifts of 12 hours and that there should be at least 12 hour as rest between shifts. [439]Thus Wheeler in his evidence cited the problem:

> It is regular practice now, and principal contractors[440] know it is happening, for a sub contractor to have staff travelling from Cornwall to London, going straight on a site, working 12 hours, and there is nothing in the current way it is controlled to stop that individual, that 'nomad' disappearing for two hours and then coming back to work a further 12 hour shift for another shift for another sponsor....A blind eye has been shown to that which I am describing.
>
> [Wheeler 2000]

As such neither subcontractor would be in breach of regulations, as the worker concerned would have worked to the limit of the shift. But of course s/he would have in effect worked 24 hours almost continuously for different contractors on different parts of the network. Neither are Railtrack officials able to detect such abuses. Thus Baldry:

> Because you don't have a single management there is no way of collating working hours for all people who happen to be on trackside at a particular moment and ensuring at present that the total hours they have worked in a given time period is within the current regulations.

It also doesn't record if the worker has a permanent job and is in effect 'moonlighting' for extra cash at weekends. As Ford characterised it:

> They (the contractors) have to rely on large numbers of casual labourers, students and night shifters, many of whom have only the most basic safety and awareness training.

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[439] Hidden, A (1988) *Investigation into the Clapham Junction Rail Accident*. London. HMSO

[440] i.e. the 'big six'

[Ford 2001: 16][441]

This issue was highlighted by the death of an Irish student who was killed in October 2000, where it was alleged that he had been recruited in a local pub and had only been given 9 hours training before being put to work on the approaches to Clapham Junction.[442] Harper (1998), in his investigation on trackside workers found similar examples of: "fly-by-night operators bringing in casuals in taxis and pay them eighty pounds in hard cash for a shift."[443] According to Thompson, (2000), an anonymous contractor estimated that in some areas of the network such 'nomads' constituted up to 50% of the workforce.[444] As Thompson reported of a meeting between Railtrack and the Association of On-Track Labour Suppliers in October, 2000:

> The problems of people working without proper qualifications or over safe working hours limit had reached certain crisis point a shortage of labour....Agencies just grab anybody. People have cards, but to maintain them you need to have assessments. Those agencies do not do that. Contractors claim that Railtrack's failure to meet its own rules for continual assessment of workers, and to remove old cards from people banned from the railways, meant large numbers of unqualified people were working on the track.
>
> [Thompson 2000]

Or as one trackside worker interviewed by Harper in 1998 said anonymously:

> Railtrack is a joke. It is totally reliant on the maintenance companies and does not know what is going on.

Such practices were confirmed by Railtrack itself in the form of a report by its Assurance and Safety Director whose report to Safax[445] noted that:

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[441] Although these also include Railtrack employees who having worked a full week, would 'moonlight' at the weekends for agencies. This is especially the case with skilled work such as signalers.

[442] The victim being Michael Mungoven. *Independent Newspaper* report: 'Railtrack hired workers in pubs and clubs.' 5/11/00.

[443] Quoted in Jack 2001.

[444] Thompson, R 'Time to Switch Track.' *Construction News,* 26/10/2000

[445] Railtrack Internal Committee on Safety. Report by J Abbott, October 2000.

There is systematic abuse with working hours being exceeded (regularly rather than by exception), rest hours inadequate excessive shifts being worked and a fundamental lack of route knowledge. Although the evidence can be difficult to establish, it would appear to be widespread and growing.

[Abbott 2000]

Both Wheeler and Baldry in their evidence pointed to more potential problems such itinerant workers. Not least of which is communication and lack of understanding at the trackside when doing safety critical work.

This arises out of the defects in Railtrack's own internal structures and the rivalry that exists between competing contractors. This has created a series of levels of management when it comes to controlling operations on the network. Corbett, (2000a) estimated that in total there were five levels of management between the workers at the trackside and the major contracting company, with a potential five more within Railtrack itself.[446]

Thus whilst instructions and guidelines for contractors working on safety critical work are clear enough at the top of Railtrack, from its safety directorate, 'Railway Safety' (see Chapter 6), the operational arm of the Railtrack, 'Railtrack Line' is separated out into seven zones, based on geographical areas. These enjoy a large degree of autonomy and discretion in how they interpret any guidelines formulated at Railtrack HQ. This has led to problems when contractors work on sites that cross the geographical zones. But this situation was exacerbated when workers for different contractors work on the same stretch of track. This is because the number of interfaces. Here for example any problems and shortcomings would have to be raised by Railtrack to individual contracting companies at middle management level and not directly at the trackside. Moreover because of the way employees report only to their company, the likelihood of issues being discussed *between* contractors is unlikely. Indeed Baldry points to this lack of communication, being in fact lack of co-operation. As he recalled:

We were given on several occasions evidence that if track workers from Scotland had been sent down to York, for example, to work on a bit of track that was unfamilar to them, they find themselves working with other employees from a different contractor. Their instinct is to ask the local people may have been told by their employer don't talk to these persons because they are employed by the opposition.

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[446] Corbett evidence to Cullen, Part 2 Inquiry, November 2000.

[Baldry 2000]

Also Knapp testifying before the Transport Committee separately investigating Railtrack's performance on Rail Investment and Renewal in November, 2000.

> The work force face pressures now that they did not have to face before. They all work for different companies and they are under pressure to keep their own company on the right side of the line, if that is the right way to put it. Is Railtrack to blame for the delay? Is it the train operating company to blame for the delay? They have to speak to their own company controller before they talk to the Railtrack controller, who are actually the ones that have to control the network.

[Knapp 2000]

Wheeler: corroborated such rivalries and the effects this could have:

> British Rail had a safety culture which meant that everyone would tun out and deal with problems, not now. When there was a technical problem you could phone anyone up for advice- this doesn't any more as this is now financially sensitive information.

This was confirmed by participants from the Public Seminar, number 4. Thus Participant B :

> I deal with contractors on incidents, who deal with their subcontractors. I can't talk to the contractors on the site directly, he needs to go through companies and Railtrack because if he gives misleading information which for example leads the contractor to got to the wrong site, Railtrack starts paying for the fault.[447]

These issues arising out of the fragmentation of point to the notion of the effectiveness of the safety case regime being overtaken by other militating factors. However, these should also be seen in another context, the commercial nature of the contracts between Railtrack and the contractors. This is the final subject of the Chapter.

Railtrack and the Contractors: the Contract Culture

> Railtrack is so pious. It wrings its hands and says that safety is paramount, yet it gets really nasty if we cannot get the job on time, usually because the time we get is impossible.

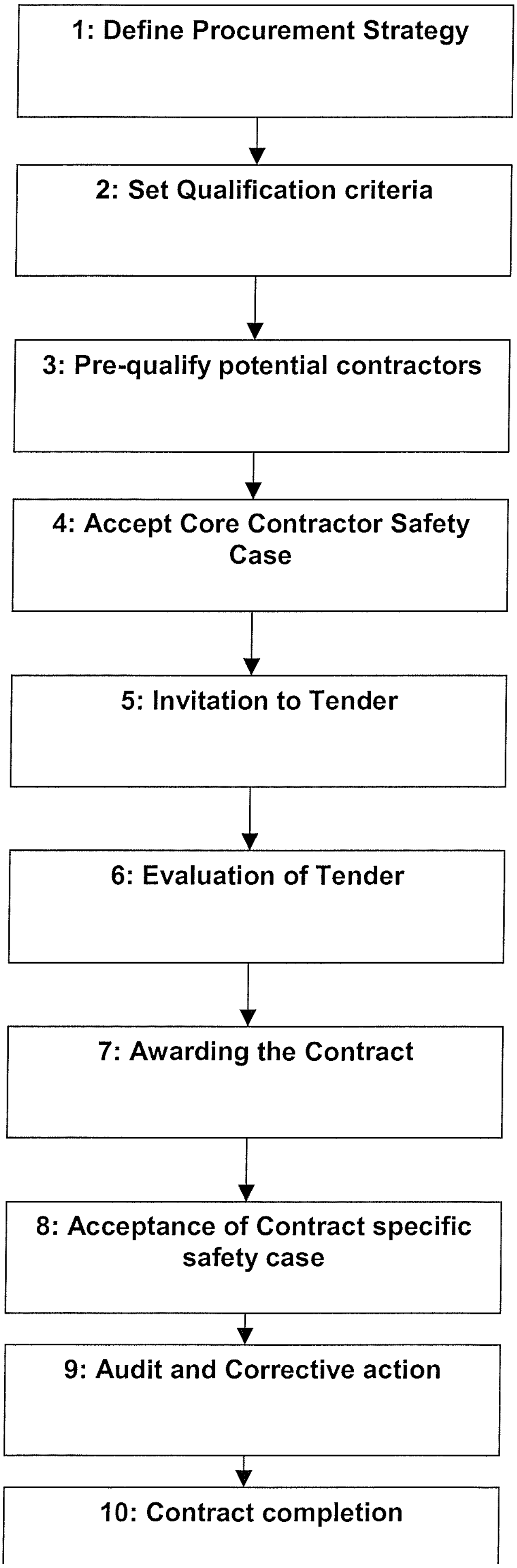
[Participant C: Public Seminar 4]

As has been stated throughout the degree the single biggest change in management in the privatised era has been the creation of accountability by

[447] Participant B, Public Seminar No. 4 October 2000.

contract. There has been a continuous debate since 1993 and this has been nowhere evident then in the contractual relationships between Railtrack and the Infrastructure companies. In 1998 Railtrack in a memorandum to the Transport Committee outlined their procedures for granting contracts to companies. Labelling it their 'Procurement Strategy' they provided the following diagram by way of explanation.

Figure 12: Railtrack's Procurement Strategy



This diagram supposedly places the safety case assessment at the heart of the contracting process, with acceptance of safety cases required at two stages. All designed to ensure that safety standards as outlined in Rail Safety Group Standards, (RGSs) are meet, (see for example Chapters 4 ,5 and 6). As they explained:

> Underlying the whole contractors' safety case philosophy is our requirement to validate that each of our main contractors is competent and will employ competent staff and sub-contractors on safety critical and safety related work.
>
> [Railtrack 1998]

Following acceptance they insist that there are a number of procedures following the awarding of a contract to ensure that things are been followed correctly. These include random checks on site and safety audits of contractors. In this light it seems that the safety versus performance issue is avoided. However, in practice Railtrack have abrogated its responsibility for safety, shifting them on to the contractors. As Middleton[448] admitted in an interview in November, 2000 the contracting out both the maintenance and renewal of the infrastructure had created a situation where for Railtrack to maintain ownership of the safe operations of the network was 'impossible.' So:

> a unique form of contract emerged placing all engineering management – and safety responsibility – into the contracting company. Railtrack was set up as a 'light touch' engineering resource to oversee that.
>
> [Middleton 2000]

This wouldn't have been so serious if there was evidence that Railtrack had adequate systems in place to undertake the type of checks and 'end products' implied in stages 8 and 9 of the 'Procurement Strategy' diagram. However again evidence points to the same inadequacy that emerged in their dealings with Great Western Trains over Southall and with the HMRI over signal SN109 at Ladbroke Grove, (see above and Chapter 6). Thus Wheeler pointed out that the risk assessment process undertaken in stage 8 was, as with the GWT before Southall and with the HMRI at Ladbroke

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[448] Technical Director, Railtrack 2000 -

Grove, a purely paper exercise and office audit, (see Chapters 5 and 7). In his evidence to the Cullen Part 2 Inquiry, David Wilks, Railtrack's Contracts Manager for the Southern zone, testified that Railtrack allowed contractors to check and supervise themselves as to the quality of work undertaken along with whether safety case requirements are being met. This despite Railtrack being aware that 40% of all works didn't reach standards.[449] In his zone:

> Weekly inspections required by controllers, the eight weekly inspection required by a section manager, the annual inspection of wheel timbers by a bridge examiner and the two-yearly examination required by a permanent way maintenance engineer were all conducted by contractors.
>
> [Wilks 2000]

This was again supported by Harper's research into trackside workers when one such worker reported anonymously:

> Railtrack is really responsible for seeing that the work gets done properly, but my work has never been checked by Railtrack, and, in my time, I have worked on some extremely dodgy jobs that require proper inspection.
>
> [Harper 1998]

Such a tendency to use the 'light touch' approach in checking work was confirmed by evidence arising from Public Seminar 4. Here anecdotal evidence reported that many Railtrack supervisors were simply not qualified to undertake inspections and that they are appointed on the basis of having general managerial experience, rather than knowledge of either rail engineering, or of any engineering experience.[450]

As the secretariat of the Seminar reported:

> A major hole in the industry safety structure is the lack of quality control. It was said that there is an appalling lack of understanding of how work should be done, and this led to shoddy workmanship. Examples were given whereby supervisors, who had little knowledge of the work being performed, undertook monitoring with a tick-box mentality.
>
> [Public Seminar, 4, October 2000].

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[449] From their own commissioned report undertaken by Dupont.

[450] One Participant related how one trackside manager was during the week, a supermarket manager.

This was echoed by the evidence arising from the Select committee charged with investigating events on the post Hatfield railway, which revealed that one major contractor had instructed their staff that rail repairs and renewals in the London area would be: "carried out at the discretion of the repairers, if they have the resources to do that."[451] Railtrack being ignorant of such instructions or procedures.[452]

This wouldn't have been so bad if it hadn't been for the nature of the contracts awarded by Railtrack and the underlying commercial pressures arising out of Railtrack need to provide shareholders with dividends and the pressure from the Rail Regulator on Railtrack, to perform against agreed targets, (see above).

Thus the early years up to 2000 were characterised by hands off approach to management where commercial aspects of contracts were given precedence over safety considerations. As Corbett admitted in the days following the Hatfield crash when asked to respond to a charge that Railtrack was cost cutting to the detriment of safety:[453]:

> The old contracts with the maintenance contractor, that were put in place on privatisation, the payment that the maintenance contractor received automatically drops.
>
> [Corbett 2000].

An important aspect of this was the tendency for Railtrack to award only relatively short term contracts with the emphasis on renewal being tied to contract performance at least cost.

Thus Baldry:

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[451] Internal memo form GTRM to staff, as reported in the *Daily Telegraph* Newspaper, 30/10/00

[452] qq 47-54, Evidence to Select Committee, 'Recent Events on the Railways.'

[453] Made by Brian Clancy, Chairman of Association of Consulting Engineers, who said that "continued coat cutting has undermined rail safety." Select Committee Report: Recent Events on the Railways, 2001.

If you are bidding for a contract on what is essentially a labour-intensive process, the only way or one of the major ways you are more likely to win the contract is through offering to do it with reduced labour costs, that is either to do the work with a smaller number of people or in a shorter timeframe.

As Knapp reported:

You can talk to managing directors of these infrastructure companies, it is a totally confrontational situation, batting away at each other about what the cost of any given contract is going to be.

[Knapp 2000]

Again the Public Seminar secretariat:

". It was also felt that fines imposed by the Rail Regulator have a "*trickle-down effect to contractors*", who cut their staff due to the enormous financial pressures to obtain and retain work.

This led the 'big six' to pass pressures down in the way they sub contractors again with the emphasis on cost and speed of completion.

Participant B at the Public Seminar confirmed this:

Contractors are forcing sub contract to bid downwards and to break the rules. Contract need to be warded on a longer term basis and alliances between contractors sought.

Or as Participant G put it:

They try to stick to the rules, but this makes them uncompetitive and leads them to pressurise to break rules and hence unsafe working.

The most important aspect of this was what Baldry characterised as the 'intensification of work' whereby fewer labourers are used in a shorter time, and hence the cutting of corners described above.

If this wasn't bad enough, contractors have been faced with an almost chaotic situation in dealing with Railtrack management with companies expected to start major contracts at a few days notice once being awarded. Something impossible to do if the proper risk assessments on project work is to take place.

As Wheeler outlined:

It tends to be short term contracts let out at short notice at the moment. I was at a joint meeting with HMRI, where a Managing Director of a renewals company made the comment that on a Tuesday he was offered a £300,000 contract which had been in negotiation for two months. He said "Good, can I now have a month to set things up to organise my materials, to organise my sub-contractors. To organise the risk assessments.. too which the answer was: "if you want the job you work this is coming Saturday night."

The second element of such pressures is the way work is organised once under way. Here again commercial pressures are very much to the fore, this time over the issue of 'possessions'. These are periods of time when contractors have access to the track in order to undertake their work. Inevitably this brings in to conflict Railtrack's obligations to the Train operating Companies to provide access for their services under the Track Access Agreements, (TAAs, see Chapter 3), and the commercial need to run as many trains as possible. This accounts for the fact that contractors do such a high percentage of their work at night and the weekend. It also impacts in that with possessions sometimes of only four hours each contractors aren't given sufficient time to undertake the work in one stretch. This leads to contractors having to apply for possessions 12- 18 months in advance and working on renewals in a less than efficient way.

As Leitch reported the reaction of one contractor:

> "We can't programme work efficiently." He cited an instance of 600 yards of track needing to renewed something tht should be possible in one go. "But we end up needing four possessions of four hours each. We go in once, then demobilise and then go back six weeks later for the next go.
>
> [Leitch 2000]

A pattern of activity not conducive to being able to pick and keep a team of trained, experienced employees.

This Chapter has discussed how privatisation prompted a re-organisation of how safety was regulated on the system. Thus the traditional model of British Rail and the HMRI was replaced by a series of levels or tiers of responsibility. The relationship between these were then examined, especially between Railtrack and the HMRI. This concluded that the HMRI exhibits characteristics of being a 'captive' regulator because of an over reliance on Railtrack, the main organisation subject to regulation. Secondly safety considerations were influenced by the existence and actions of the industry's economic regulators, the Office of Rail Regulator and the SRA (formerly OPRAF).

Finally, the regulatory structure was placed into the wider context of the largely unregulated element, of the sub-contracted section where literally thousands of organisations aren't required to hold a Safety case, but nonetheless work along side safety case holders as part of the industry. This revealed that a combination of fragmentation of responsibilities, poor management and economic and commercial pressures has created an almost chaotic situation on how the network is maintained and renewed.

Postscript

As this degree was being completed in August 2002, the HSE published their first interim report about the Hatfield crash of October 2000.[454] In this they pointed again to the lack of sufficient training and expertise both for trackside workers and Railtrack supervisors and monitors. As their press release pointed out the recommendations centred on:

> on improving the management of health and safety and maintenance, track design and inspection, and rolling stock and infrastructure design.
>
> [HSE 2002][455]

This despite the repeated comments on these matters that have been aired since 1993.

[454] 'Hatfield Derailment Investigation : Interim Recommendations of the Investigation Board.' HSE September 2002

[455] HSE Press Release C-36:02 22.

Conclusion

We shall not cease from exploration

And the end of all our exploring

Will be to arrive where we started

And know the place for the first time.

[TS Eliot. Inscribed on a glass frieze, Liverpool Lime Street Station]

Failing organisations are usually over managed and under led": Warren Bennis.

We trained hard, but it seemed every time we were beginning to form up into teams, we would be reorganised. I was to learn later in life that we tend to meet any new situation by reorganising and it is a wonderful method of progress for producing confusion, inefficiency and demoralisation.

Caius Petronius, Roman Consul, AD66

This thesis has outlined the way risk management in the UK Rail industry changed and developed in the years leading up to, and immediately following privatisation.

The transition to public ownership of the former 'British Rail', was a one of the last great acts of privatisation under the Conservative Governments of 1979-1997. This process attracted a lot of discussion and controversy in political discourse and through media attention. In particular the debate has concentrated on the desirability of replacing publicly accountable management with private sector structures. In the immediate aftermath much controversy was focused on an examination of performance based indicators that were typically consumer rather than safety orientated. For example, punctuality, reliability, cost, hygiene, and comfort on train services were commonly cited as indicators of organisational performance. However since the Southall crash (1997); the Ladbroke Grove crash (1999), and the derailments at Hatfield, (2000), Great Heck, (2001), and Potters Bar, (2002), the issue of safety in the privatised industry has come under increasing scrutiny.

Specifically, the thesis has examined how the safety and risk management regime in terms of existing socio-technical theories, which developed in the 1970s and 1980s to challenge the scientific perspective of risk, Royal Society, 1992; Horlick Jones, (1996). However, unlike for example Turner, (1976; 1978), the research hasn't focused on establishing the causation of individual disasters, in order to demonstrate the appropriateness of the Turner-Toft model. Rather, it has attempted to establish the principal of organisational complexity in the rail industry in terms of Perrow's theory, 'Normal Accidents', (see Chapter 2), and how such complexity has served to nullify the existing safety regime.

This was done by firstly examining the theoretical background to the study, with discussion in Chapter 2 of the scientific perspective of risk upon which risk management in the railways is based. The objections to this and the alternatives arising from the social sciences, were the subject of Chapter 2; including discussion on Perrow's theory on Normal Accidents' where far from being aberrations, accidents are outcomes of organisational systems and structures, (Perrow, 1999). In this situation however successful constituent parts of the structure are seen as efficient and safe – as for example argued by Laporte and Rochlin, (1994) and Sagan (1995) – the complexity of the system will nullify any such efficiencies, Perrow, (1994).

Such discussion has been thrown into relief by examining the role and utility risk management has played in decision making in the Rail industry from 1988 to 2001. To do this there had to be discussion of the wider context of the way public services were managed and administered changed in the years following 1979.

In the rail industry too the regulation of the railways has been devolved to such bodies as the ORR; OPRAF (now SRA); and the HSE, (see also Chapter 2 & 3).

Attendant to this, and as the state has divested itself of its role as a direct provider of goods and services, elected politicians have become increasingly insulated from making and being responsible for decisions about risk. The most obvious indication of this is the increased emphasis on using Quantitative Risk Assessment methodologies in making decisions about risk, see for example the ILGRA reports, (1996 and 1998). How this was manifested in the rail industry was the subject of Chapter 4.

Thus in the years following 1979 the then conservative government's belief in the superiority of the private sector to the public sector bureaucratic model was played out by reform of the central civil service and the sale of public utilities. This had the result that provision of public goods became de-politicised with services been provided by a mixture of non- governmental agencies and bodies accountable in managerial terms, and others been entirely provided by the private sector, e.g. British Telecom; British Gas etc.

The privatisation of British Rail was part of this process; being graduated over a period of nearly 20 years. During that time it was subject to a number of initiatives, both in terms of re-defining its' functions and how it should be organised to deliver them. Internally, there was a managerial revolution designed to place its' business functions in primary position over the engineering ethos.

The logical conclusion of this process was the privatisation of the system itself, with the central aim being to promote competition within the new structures, devolving service provision to private enterprises; regulated by a mixture of public officials and the power of contract accountability. In this newly commercial world, the provision of safety was to be informed and driven by managerial principles and practices that were to supersede the old 'railway' or engineering culture.

This was the subject of Chapters 3-7 which outlined the way the management of safety changed in the run up to privatisation in 1993. It posited that developments such as the adoption of QRA approaches to risk mirrored the TQM approaches taken by British Rail in the 1980s. However, it was also established that the way privatisation led to a fragmentation and an increased complexity of the industry, with accountability being based on contractual arrangements the parties militated against such dissemination.

In the context of Perrow's theory the failings of the scientific approach, which assumes that such judgements take place in 'closed systems' and where decisions on safety take place in the context of safety cases that are largely uninfluenced by outside factors, were exposed in Chapters 4 and 6. Thus such insulation has never been the case in the rail industry and even when it was a public monopoly there were myriad interfaces. The privatisation process ensured that such an 'open system' would be exacerbated as the number of regulators and operators proliferated.

In such circumstances, the attempts by Railtrack and the regulatory authorities to create a uniform approach to identifying risk and assessment by using QRA techniques in particular, were demonstrated to have failed as individual constituents of the system, such as TOCs perceived and prioritised risk differently. Additionally it was established that management and staff of the principal promoter of decision making on the basis of risk assessments, Railtrack, were subject to conflicting pressures when making safety decisions. This was also the case for the industry's ultimate overseer of safety, the HSE and HMRI as the overseers of safety provision.

The final Chapter developed these themes concluding that the safety regulators exhibited characteristics of being a 'captive' regulator because of an over reliance on Railtrack, the main organisation most directly subject to regulation. But it was also established that the role of the industry's economic regulators, the Office of Rail Regulator and the SRA (formerly OPRAF.), also militated against safety on the railway.

Finally, placing the regulatory structure, and its principal method for ensuring safety reinforced the notion of the railways as an 'open system' – the safety case- was placed into the wider context of the largely unregulated element of the sub-contracted section. Here literally thousands of organisations are employed but aren't required to hold a Safety case. Here the evidence revealed that a combination of fragmentation of responsibilities, poor management and economic and commercial pressures has created an almost chaotic situation on how the network is maintained and renewed. Given this the safety case regime has been shown to have failed and attempts to utilise QRA methodologies have at best been only partially successful. In these terms what can be deduced about how safety can be delivered on the railways. This is the subject of the final section.

Rail Safety: Back to the Future?

> There are areas where the private sector has worked well and areas where, as with parts of the railways, it's been a disaster.
>
> [Tony Blair: Labour Conference 2001]

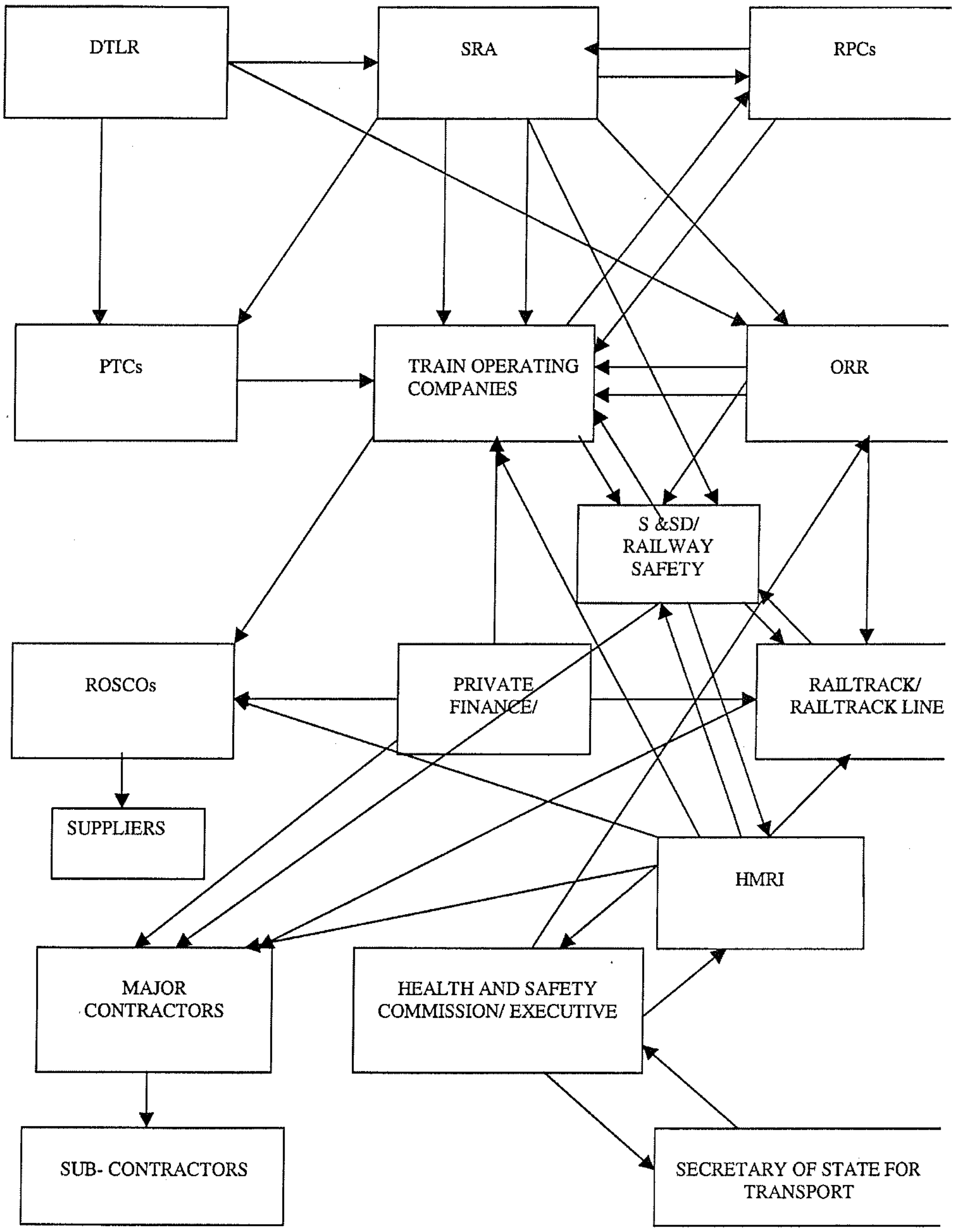
> If it follows that if the systems have catastrophic potential they should be abandoned, drastically reduced, or drastically reduced.
>
> [Perrow 1999: 369]

> I wouldn't start from here.
>
> [Traditional Joke]

This final section will attempt to draw some conclusions on the preceding research and suggest the need for more research into previously neglected approaches in risk management. This will be done under the headings of Organisational reform; technology and rail safety; risk management and rail safety.

Organisational Reform

THE COMMERCIAL AND SAFETY REGULATORY REGIMES IN THE RAIL INDUSTRY 1993-2001



One of the recurring themes in the research is the very complexity that characterises the private rail industry, mirroring Perrow's theory about organisational complexity, (see Chapter 2). This can be seen above which outlines both the commercial and safety regulation nexus and which pulls together the discussion of relationships in Chapters 3-7. This section will debate the issue in terms of rationalising the number of organisations involved, the removal of the complicating issue of organisations at the heart of the system having to react to conflicting pressures in terms of safety and performance and profits, and the way the industry has been regulated.

Rationalisation

Rationalisation has been the subject of extensive debate between the various parties involved from politicians; media commentators on the industry; [456] figures in the industry, both in public and private[457]; and regulators including the former head of the HSE, Jenny Bacon, (see Chapter 5). Additionally, both of the Inquiries arising directly out of the Ladbroke Grove crash have passed comment on the need for rationalisation in order to reduce the risk interface on the system. The leaders of the transport unions and representatives of the passenger watchdog the Rail Passengers' Council (RPC); and most poignantly, the representatives of survivors and bereaved of train crashes.

All point to the need for rationalisation of the industry. Whilst most discussion has centred on the commercial advantages of fewer, larger franchises, such moves will inevitably lead to less interfaces in the system. Thus the RPC report (2000) argued for franchises not of seven years, as was the original arrangements, but for 20 years. Green, (2001) made the argument thus:

> The UK rail network is a tightly integrated system, which requires minute by minute planning to make it work. The railway is a single system, whether we like it or not. The more we fragment the ownership, the more we need to bind the system back together again with strong leadership and structures.
>
> [Green 2001:8]

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[456] Christian Wolmar, author of 'The Great Railway Disaster' and most notably, 'Broken Rails.' And Transport correspondent for '*Rail News*.' Roger Ford, correspondent and one time editor of '*Modern Railways*'. Nigel Harris, Editor, '*Rail News.*' Keith Harper, former Transport correspondent for the *Guardian* newspaper. It was Wolmar that characterised privatisation as introducing "risk at the interface."

[457] Several of the people interviewed in the course of the research made private comment made in confidence on the subject. Publicly, Gerald Corbett, Chief Executive of Railtrack, 1997-2000 was one amongst several witnesses to call for rationalisation, see Chapter 8.

The move to rationalise the industry has also found support in Parliament with the report of the Select committee on Transport (2000) and the government sponsored QUANGO, the Commission for Integrated Transport.[458]

Of course the question is how the industry should be bound together, whether by evolution in the form of longer franchises, or by revolution through re-nationalisation. The logical conclusion of the history of the rail industry in the UK – and especially the privatised era – points to evolution, rather than more wholesale change. As Maidment commented in the course of an interview with the author:

> The rail industry has over the last 50 years or so, been reorganised on average once every two years. The last thing the industry needs is another re-organisation.
>
> [Maidment October, 1999]

Green too has supported the gradual restructuring of the industry to reduce the number of organisations operating.

> We have not got time to reverse history with another four years of re-restructuring, re-nationalisation or primary legislation. We have got to fix the house that we have built and that means unifying industry leadership, streamlining the existing structures and delivering real quality. Our future lies in our own hands and not with organisational consultants and legislation.
>
> [Green 2001: 5]

Since the awarding of new franchises this is what has been happening, with the Select Committee on Transport reporting in 2002 the move towards less train operating companies, (TOCs), albeit slower than expected. Thus they reported that of the 18 franchises expected to be reformed and integrated, as of December 2001 only 3 had been settled [459]. Moreover, the initial enthusiasm for such contracts has lessened as the Select Committee reported:

> The Government's decision to place less emphasis on long-term contracts is a significant step backwards from achieving the goal of high quality passenger services. We recommend that new long-term franchises be awarded without delay if there is to be a step-change in the quality of rail services. Priority should be given to safety, performance and

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[458] Established by the Transport White Paper, 2000. See press release 22/04/2002.

[459] First Report, Transport, Local Government, and the Regions, January 2002

investment when negotiating the new contracts and the basis for choosing the preferred bidder should be transparent.

[Select Committee 2002:29]

Additionally, Railtrack has proposed plans for rationalising their operating system from seven zones, to four based on the geographical areas run by the 'big four' companies before World War II.[460] Again in an attempt to reduce industry interfaces. Its successor, Network Rail is likely to follow these plans.

If risk interface is to be reduced then the process needs to be speeded up. Of more long term possibilities is that the re-nationalisation of the whole network. This has been advocated chiefly by the transport unions. This is argued on the basis of reducing the interface risk that privatisation created and of helping to recreate the engineering, or 'Railway Culture' that was dominant in the 1950s and 1960s, (see Bonavia Chapter 3).

However, this would cause a more immediate and substantial upheaval and probably serve to delay investment. It would also be against the present trend of Public Private Partnerships and arrangements that have been favoured by successive Labour governments.[461] Renationalisation would also have the effect of re-introducing the worst aspects of the problems under British Rail where investment and pricing policies were taken under direct political pressures of the day. [462]Such short-termism would also be to the detriment of any long term plans to introduce safety technology such as ATP, or ETMS, (see below). Finally the positive aspects of privatisation including a more customer focused approach, might be negated. But the issue of fragmentation remains the one overriding flaw mentioned in connection with privatisation. So what should be done?

One suggestion that has emerged is a compromise between the nationalisation and the status quo, partial rationalisation of the existing TOCs.

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[460] i.e. The Great Western Railways; London Midland & Scottish; Great Northern Railways; Southern Railways.

[461] As of 2002.

[462] Grayling, T (2002) Back On the Rails, IPPR, London.

Thus the 26 TOCs at present should be gradually merged to re-create the 'big four' concept in train operations as well. This would re-introduce the concept of vertical integration into the industry that was characteristic of British Rail before 1979 and reconnecting ownership of train operations and the maintenance of the infrastructure on which they run. Critics have pointed out that the system would still be fragmented and that such new franchises wouldn't entirely replicate the old geographical areas. However, it could be both more efficient and safe as operational and maintenance staff would be under one overall source of control and direction. This should reduce the safety versus profit scenario and as a sense of identity was established, something akin to the old 'Railway Culture.' As Green demanded, the 'sergeant majors' would return[463]

Whatever the future, radical change has already occurred to the industry's organisational structure since the author's interview with Mr Maidment in October 1999. And whilst rationalisation hasn't happened a sea change has occurred at the heart of the industry with the end of Railtrack as a Publicly Limited Company. This was as a result of a loss of confidence in them from politicians, the public and the City financiers led to a situation of near bankruptcy in the twelve months following the Hatfield crash, (see Appendix 3). Thus on the 7th of October the company was declared bankrupt by the High Court and placed into administration. In March 2002, Network Rail was created by the Government as a "company limited by guarantee" with the principal purpose of acquiring and owning Railtrack PLC. On 27 June 2002, Network Rail and Railtrack Group PLC agreed, subject to the satisfaction of certain conditions, to acquire Railtrack PLC.

One of these conditions was the approval of the acquisition by the shareholders of Railtrack Group PLC. This condition was satisfied on 23 July 2002 and soon after it is anticipated that the remaining conditions, including the Court Order which placed Railtrack into administration was discharged.

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[463] Green, C (2001) 'Phoenix from the Ashes' The Sir Robert Reid lecture, 13/02/2001.

Network Rail will assume the role of infrastructure provider, but will be responsible to stakeholders representing the industry, unions and the passengers. As of September 2002, this had already begun to cause controversy with for example issues of financial and political accountability being raised[464]. However, in terms of Perrow's model it will serve to take the safety versus profit dilemma discussed in Chapters 6 and 7, out of heart of the industry. Additionally, the complexity of the system is being reduced by the reform of the contracting sector, with the emphasis on longer, more flexible contracts being awarded.[465]

The Regulators

Another area of controversy has been the regulatory structure that was established to oversee the privatised industry. Here claims have included the confused nature of responsibilities and the conflicting pressures they have brought to the operators and to Railtrack.

This has been particularly the case with the actions of the Office of Rail Regulator and his attitude towards Railtrack's performance. But it's not just Railtrack who have criticised the pressure applied to meet performance measures and passenger groups, safety pressure groups and trades unions. The rationalisation of regulators and the fusing of the ORR and the SRA has been advocated by various bodies and institutions. Even if this wasn't the case the situation remains that there is a confusion of responsibilities between the Strategic Rail Authority and the Regulator and the HSE. Indeed the Cullen Inquiry examined evidence of the possibility of adopting the Civil Aviation Authority model of combining both economic and safety regulation.[466] This would again serve to clarify and to some extent unify the conflicting

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[464] See for example, Smith, P (2002) and Clark, M (2002).

[465] See for example Whitehead, T (2000) 'Express' in *Construction News*, March 2000, and Abbot, J (2001).

[466] See for example Public Seminar No 2: The Regulator's Perspective.

pressures. Which along with the establishment of Network Rail as a not for profit organisation, is likely to be lessen the profit versus safety conflict.

The Regulation of Safety: the HSE

Regarding the regulation of safety the principal impression left by the research is the degree to which the safety regulator, the HSE in the shape of the HMRI have been both dependent upon Railtrack - in the shape of Railway Safety, the safety arm of Railtrack – both in terms of seconded personnel and in driving safety initiatives in the industry, (see Chapters 4-7). This is a function of the under funding of the HMRI and the degree to which HMRI Inspectors have trusted personnel at what was a company under financial and commercial pressures, (see Chapter 7). In such circumstances it wouldn't be unreasonable to suggest that rail safety be taken out of the remit of the HSE and that the existing Inspectorate be reformed in a stand alone organisation and any residual responsibilities for safety that reside with the economic regulators be revoked. A position supported by many of the witnesses at the Cullen Inquiries.

Of course the creation of another organisation would introduce more complexity into the system and could be counter productive. However, the logic of the findings suggest that any rail safety Inspectorate should either stand apart from the HSE or be re-integrated into the Department of Transport. This is because of the fact that the HSE still advocate a system for delivering safety on the railways that has been shown to fail: viz. the Safety Case regime and the use of QRA and the ALARP principal with its emphasis on balancing safety projects against costs, (see Chapters 4 – 6). Discussion on this will be reiterated briefly in the next section.

The Safety Case Regime

One of the central recommendations of the Part 2, Cullen Report, (2001) was that the safety case regime should be extended to cover more of the industry. This despite the criticisms it attracted both directly and indirectly from witnesses at the inquiries. Bacon (1999) and Coleman (1999) reported that safety case holders regarded the award of safety case authorisation as a licence to do nothing more in pursuit of safety, before the Southall and Ladbroke Inquiries began. [467] O'Connor (2000)[468] also pointed to this problem when he stated:

> Safety cases create a false sense of security that all risks have been addressed. The organisation has gone through this time consuming and expensive procedure and finally a document, the safety case, is accepted. Then there is inevitably, again this is a human nature issue, that safety has been looked after, we have our safety case.
>
> [O'Connor 2000]

Aside from complacency, the main disadvantage of the safety regime is that it is highly prescriptive, and involves subjecting time and resources to minor adjustments or innovations in technology. For example, undertaking cost benefit exercises on introducing automatic ticket barriers at stations.[469] In this conclusion O'Connor is supported by the findings of an industry survey undertaken by Mercer Management Consultancy for the DLTR.[470] Interviewing over 50 officials and workers throughout the industry, they found that contrary to Cullen's optimism about the utility of the safety case approach, they too were critical of its' prescriptive nature. Thus:

> The safety case was thought to be too prescriptive with many safety standards considered excessively, bureaucratic and difficult to change.
>
> [Mercer 2002: 27]

This is ironic given that the supporters of the regime, such as Cullen and Maidment and successive senior officials at Railtrack and latterly Railway Safety, along with the newer generation of rail regulators and Inspectors, have

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[467] Coleman, V and Bacon, J, (1998) Evidence to select Committee for Environment, Transport and the Regions. First Report: *Railway Safety*, HC 30. 1998-1999.

[468] Reliability manager at British Rail Research, 1993-1995.

[469] An example brought up in the course of an interview with a Railtrack official.

[470] 'The UK Rail Industry on its own words: Problems and Solutions', 2002

done so on the basis that it would reduce prescriptive rules that was characteristic of the old 'Railway Culture'[471]

But apart from this general issue of complacency and the inappropriateness of its management systems, the research has pointed to the approach taken in safety cases being flawed. As O'Connor pointed out:

> . there is a danger of placing too much emphasis on the management system and on inappropriate quantitative analysis is that that important potential causes of accidents are not revealed because all attention is devoted to complying with the formal, mandatory requirements.
>
> [O'Connor 2000]

This is because concentration on risk assessment techniques is inappropriate because any actions are based on such small databases. See also Evans and Horbury, (1999), quoted in Chapter 6, in their review of how companies operated their QRA techniques; concluding that QRA techniques can only be effective for issues that affect the national network. This wouldn't preclude the theoretical use of QRA to assess say ATP and its successors, (see Chapters 4 and 5), but even here the data is comparatively small on which to base judgements and project estimates of lives saved (see for example Evans, 2000 on ATP preventable accidents from 1968-1999.)

Not surprisingly perhaps the industry insiders interviewed by Mercer Management, wanted to continue using the cost benefit method of decision making. However, Chapter 6 revealed the extent to which CBA can be subjective exercises designed to reinforce and legitimise decisions already made, and whose use contributed to both the Southall and Ladbroke Grove disasters, (see Chapters 5-7).

This concern to stick to ALARP has also characterised responses from academics and media commentators[472].

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[471] See for example. Maidment, 1999 and interviews with Railtrack officials, April and November 2000.

[472] Including most prominently AE Evans, Professor of Transport Studies, UCL and David Begg, Chair of the Commission for Integrated Transport, and leading commentators in magazines such as Rail, modern Railways and Rail News. Additionally, Wolmar argues for the inferior system in Broken Rails 2000

But O'Connor goes further in his criticism of the use of the safety case regime, saying that whilst they may be appropriate in allying fears associated with societal risk, as with a new nuclear power station, or petrochemical plant, they are not appropriate for industries such as the railways where new, revolutionary technology isn't typically introduced regularly. Thus for example the basic technology associated with operating a rail network has evolved rather than necessarily leapt forward. As O'Connor stated in 1996:

> It is relatively easy to accept that this approach (safety case) is appropriate in the context of a new system that involves perceived societal risks...in such cases (nuclear power and petrochemical plants) there is usually a considerable amount of engineering novelty, and possible public anxiety must be assuaged. However, these factors do not generally apply to existing systems such as railways. The great majority of existing systems and operations present risks well below what are considered acceptable (no one is afraid on a train!), and there are few novel technological applications which introduce risks.
>
> [O'Connor 1996:4]

This will be the subject of the next section which will consider the current state of safety technology on the network and comment up on the future.

Safety Technology and Risk Management

The aftermath of disasters at Clapham Junction and Ladbroke Grove[473] led the Transport minister at the time to announce to Parliament that everything must be done to avoid the tragedy happening again.[474] Prominent among such announcements was the pledge to spend as much as was necessary to ensure the elimination of SPADs, by the introduction of ATP. However, Chapter 5 discussed how ATP was rejected on the basis of CBA analysis using the ALARP principle. The aftermath of the Ladbroke Grove crash led to similar assessments as to whether ATP, or it's successor, ERTMS (the European Rail Traffic Management System), which is an enhanced version of the ATP technology (see Appendix 5). The result of CBA

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[473] See Appendix 3 for details.

[474] After Clapham in 1988 this was Conservative Minister Cecil Parkinson, 1988. After Ladbroke Grove, in 1999, it was Labour's John Prescott.

analysis concluded that despite the deaths of 31 people and approximately 500 injured at Ladbroke Grove, ERTMS - which would guarantee the elimination of SPADs - should only be phased in gradually, with an initial target date of 2010, being put back to as late as 2030[475]. Meanwhile a cheaper system, TPWS – which is only effective in eliminating SPADS on trains travelling less than 75mph[476] - will be instituted only selectively on the network spots. (For details about these systems, see Appendix 5).

Indeed the Commission for Integrated Transport don't want the ERTMS at all, arguing that In terms of costs and benefits it would only save 0.74 deaths per annum at a cost of £3.4bn.[477] Moreover, as it would stifle rail capacity and thus force people on to the road, it would have a net result of 22 more fatalities. The irony of all this is that despite studies such as CfIT's, ETRMS will be introduced anyway, as it is subject to a directive from the European Commission. [478] Consequently, the result of such CBA exercises is that for a period of time on some stretches of the UK rail system there will have three different safety technologies with the potential for confusion and the very waste of resources that CBA exercises are supposed to avoid.

So what then can be done?

Many proposals and plans have been laid since 1999 and the Ladbroke Grove disaster. Not least has been the commissioning of three major public inquiries. However the consensus in the industry is that the Safety Case regime and that the prominence of CBA in making decisions on safety should continue, and that this should also inform the regulators, whether they stay in the HSE or become a totally separate body. But there is an alternative, and

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[475] Christian, L 'Rail Inquiry Sidelined' Letter to *Guardian Newspaper*, 06/06/02

[476] And therefore wouldn't have prevented the Southall crash, 1997, see Appendix 3.

[477] CfIT Fact Sheet 10: The implementation of rail safety measures: implications for overall safety on the UK transport system. April 2002.

[478] EC Directive 96/48/EC: 'Inter-Operatorability for the Trans- Europe High Speed Network.'

one that encapsulates many of the themes discussed above and in the main body of the research: namely to learn from the way Japan has handled the privatisation of its rail system.

Japanese Railway system: it's the culture stupid

Japan's safety record for passenger safety is about 200 times better than the UK and European averages.[479] This despite Japan having a much larger rail usage compared with the UK, with 9 times the number of passenger kilometres travelled. (The Japanese rail/road mode share is 36% compared with the UK's 6%). Also passenger densities in Japan are much greater and therefore requires systems to be ultra reliable. For example, the Tokyo and London subways are similar in size but the Tokyo subway moves 3 times the number of passengers per year.

The Japanese is also a privatised system, with similar levels of investment on safety and maintenance. There are however, several crucial differences between the UK and Japanese systems. Firstly, the privatisation of the Japanese system precluded the conflict between profit and safety by retaining the infrastructure in public hands – something being latterly addressed by the UK government, with the purchase of Railtrack by Network Rail, (see above). It also created private train operating companies, but on geographical lines to ensure vertical integration, instead of the horizontal model favoured by the Major government, where ownership was on the basis of contracts. This has yet to be addressed by the Labour Government, (see above). Another difference is that unlike the UK, the Japanese government does not get involved directly in investment planning by the private companies.

As to regulation, safety standards are set not by a QUANGO such as the HSE, but by the Japanese Ministry of Transport, through statute keeping the political accountability discarded by successive UK governments. A consequence of this is that unlike the UK decisions on safety and technology are not subject to CBA exercises. As the seminar secretariat commented in Japan:

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[479] Public Seminar, No. 5

Currently, the money being spent on safety is not out of a need to improve safety but out of a quest to continually improve it.

[Public Seminar 2000][480]

This has led to a situation where unlike the UK, derailments such as at Hatfield and Potters Bar are unknown, and 95% of rolling stock is less than 10 years old. Of course this is also a function of consistent investment, not just after, but before their system was privatised in 1988. In contrast to the British experience from the 1970s to the late 1990s of low levels of investment, (see Harris & Godward, Wolmar etc.). This also allows for more maintenance staff and not being so reliant on contracted labour. There is also the existence of a strong safety culture, based on engineering priority. Thus in Japan there is no 'value' or cost cutting engineering and cheap solutions are not seen as appropriate. For example the Shinkansen trains are fitted with 25% extra traction equipment to provide the reliability levels required. Further, they are not time tabled to run at maximum speed so the wear and tear is reduced. Similarly with signalling systems, additional defence redundancy is provided by fitting completely independent 'hot' systems that are left running in the case of failure of the primary system.

This is the principal difference between the UK and Japan: the Japanese have managed to retain the Railway Culture, British Rail and privatisation tried so hard to replace with a business culture. Again the secretariat:

One of the reasons that the system is operated so safely and punctually is because of the staff. It is not just the provision of hardware. There is a totally integrated training plan for employees. There is a team spirit with a high degree of commitment and motivation. Timekeeping is seen as an essential part of safety. For example, every driver is given a company watch when he starts his training and it is placed on the console in the cab, thereby embedding in the staff pride in the company and timekeeping. The driver is trained to acknowledge the aspect of each signal with a finger pointing salute and says aloud what the aspect of the signal.

[Public Seminar 5]

This springs from two approaches to rail provision the secretariat identified as '4S and 'Kisen'. '4S' corresponds to *sweeping, sorting, sifting,*

480 18/10/2000.

spick and *span.* With adjectives used to describe Japanese railway staff as being, neat, clean and alert, and very proud of their railway system. 'Kirsten' is the notion of the need for everyone on the system to improve and strive to be better.

In contrast, the Inquiries into Southall and Ladbroke Grove and associated Seminars revealed a situation where the safety culture of the UK railways has accepted violations of rules and unsafe acts that have gone unchecked which could alone, or in combination, create an accident.

As it stands the industry is still failing to identify these non-compliances and is therefore not learning from them. *Pace* the extension of the CIRAS system where workers can report incidences in confidence without fear of being disciplined, to the whole industry,[481] it is still the case that there is no adequate to allow frontline staff to suggest improvements or to make a change to the rulebook.

It is only after a disaster or an incident that any non-compliance is punished. In this sense, there is no consistency of approach.

Of course it could be argued that part of this is down to cultural differences between the two countries and that consequently it would be difficult to translate these approaches into the UK. This is partially refuted by the experience in car manufacturing where Japanese practices have been introduced and adapted. However, what is necessary is to restore the Railway Culture to the UK system.

The Japanese have shown that regional integration has preserved a sense of ownership, and that companies can deliver efficient and safe operations without recourse to under funded regulators over reliant on organisations they are supposedly supervising.

Given that the UK rail infrastructure is to be taken back into a form of public ownership that precludes having to distribute profits, the next step is to take the cost benefit equation out of the establishment of railway standards, to promote such a culture. A separate rail safety body dedicated to producing such engineering based standards can do this. It could then be left to individual companies to make their own safety arrangements to meet them.

[481] For details see Chapter 7.

Inspections that reveal lapses should be reinforced by punitive sanctions as opposed to the present system of too little enforcement orders which result in trivial fines (see Chapter 7). If companies are then involved in an accident and it is found that they have failed to meet required standards on say driver training, then they should be liable to both civil and criminal prosecution, both collectively as well as individual directors. But to do this requires legal intervention, and this will be discussed next.

From Corporate Manslaughter to Corporate Killing

If civil and criminal prosecutions are to be successful then there needs to both a change in the law and in the method evidence is gathered.

Resorting to legal remedies and sanctions has been decried by industry members on the basis that it will introduce a blame culture that would further inhibit the sharing of knowledge and experiences within the industry, or as Toft puts it 'industry isomorphism'.[482] This overlooks the fact that they already admit to one existing. Also, mechanisms for prosecution of companies already exist, principally in the form of the Health and Safety at Work Act, 1974. However, the history of prosecutions has been patchy to say the least, see for example Cole (1991). He found that in the period 1979-1990, in the staff of the HSE was reduced, as economic activity increased, affecting their ability to investigate and prosecute offences. This led to a 'realistic' approach to prosecution where they only pursued cases where there was a very strong possibility of success and employers had been previously been warned about their actions.[483] Reference to the conviction rate points to this, as does the fact that prosecutions were static in the 1980s. [484]As he remarked of prosecutions generally:

> The criteria for prosecution should be the seriousness of the contravention rather than the severity of the accident. But the extent to which the employer could be said to be responsible for the circumstances leading to an accident and whether the employer had been previously warned of a similar infringement are also relevant.

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[482] See again Learning from Disasters, Perpetuity Press, 1997.

[483] Cook, 1991, p. 133

[484] Again Cook, p. 69.

[Cole 1991: 133]

Neither did this change in the 1990s as the Transport Select Committee concluded in 2001:

> We are disappointed by the low levels of investigation and prosecution that are undertaken by the HSE. There is an urgent need to increase rates on both counts... decisions in the past appear to have been unduly dictated by availability of resources.
>
> [Transport Committee 2001: para 29].[485]

Such remarks could and have been said about the HMRI, (see Chapter 7). Bergman (2002) characterised the HSE as persuaders and encouragers, rather than by nature prosecutors. Thus:

> In this task, in-depth criminal investigation is not required, but rather a far more pragmatic use of persuasion, encouragement and other non-legal solutions.
>
> [Bergman 2002: 83]

Nor do the effects of prosecution afford any comfort, with the present legal structures for dealing with Health and Safety offences. Most health and Safety offences can be prosecuted and sentenced in either the Magistrates courts or the Crown Court. The initial hearing is at the Magistrates and if a guilty plea is entered, it is at the discretion of the magistrate as to whether to sentence there and then, or to send it to the Crown Court. This is important because currently if magistrates are limited to a maximum fine of £20,000 if the offence relates to a breach of the Health and Safety at Work Act 1974 itself or other similar Act of Parliament.[486]

If however, the sentencing takes place in the Crown Court, there are no maximum fines. Although the magistrate decides, the prosecutor representing The Health and Safety Executive or Local Authority can make representations to the court if they consider that the case is serious enough to warrant sentencing in the Crown Court. However, there is no guidance to its inspectors on when "the offence is so serious" that the case should be referred to the Crown Court

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[485] Select Committee, 4th Report: The Work of the Health and Safety Executive, 2001

[486] Information from the Centre for Corporate Accountability website.

This discretion is potentially important, as there is the possibility of inspectors being faced with a conflict of interest. As Bergman puts it:

> They (inspectors) work within organisations whose goals are in conflict with a criminal justice response. It also shows the possibility of a serious conflict of interest: an inspector may be responsible both for inspecting, and for conducting an investigation, into the same company when a death or serious injury occurs, an inspector who had failed to undertake proper inspections in the past – by for example not picking up on obvious dangers of failing to inform the company of necessary changes – may have a vested interest in not prosecuting in the future to avoid his shortcomings being made public.
>
> [Bergman 2002:84]

Bergman cites an example in evidence, but from the Ladbroke Grove crash there remains the possibility that the HSE will be prosecuted by Thames Trains over their in relation to Signal 109.

The HSE are to prosecute both Railtrack and Thames Trains over the Ladbroke Grove crash, but only the auspices of the 1974 HASWA. The idea of criminal prosecution for corporate manslaughter was dropped by the Crown Prosecution Service, and the British Transport Police, because of the difficulty of prosecuting companies and individuals. This arose from their previous experience over Southall crash. Thus in order for any prosecution to be successful it must be established that there was a 'controlling mind' behind any negligence that contributed to accidents. This is because under existing law, corporation's distinct legal entities, separate from such persons as may be members of it, and having legal rights and duties and perpetual succession. It may enter into contracts, own property, and employ people and be liable for torts and crimes.

Corporate Manslaughter

The case of Salaman v Salaman in the 19th century established that a company is a separate legal entity to its directors. Theoretically, therefore, the company should be liable in criminal law in the same way as a person. Until the very recent past, however, this hasn't happened. In the most serious of cases of corporate negligence, conduct which gives rise to a death, (corporate manslaughter) there have only been four prosecutions in the 20th century. This is especially surprising given the existence of Liability of fault. As Wells explains:

Liability without fault. In civil law the concept applies where a person is liable despite the absence of fault or negligence; e.g. in the liability for the escape of dangerous things. In criminal law there is said to be strict liability even in the absence of mens rea.

[Wells 1995:87]

However, unlike Manslaughter a successful action for liability for limited offences doesn't require the element of intent required for a criminal conviction following a death. As many breaches of regulatory regimes come under the heading of strict liability, companies have been successfully prosecuted.

In this, Company officers, directors and employees have been prosecuted as individuals. This may make it seem as if it wasn't necessary to prosecute companies as well. But if it can be shown that such prosecutions can act both as a deterrent to other corporations and as a punishment to those who, although responsible for company policy, might have otherwise escaped prosecution, then it should be pursued.

Regarding identifying individual directors for manslaughter since the 1970s the issue of the level in corporations at which there can be said to exist a 'controlling mind', has been a source of controversy and debate, with the normal assumption is that it at Director level.

However, this was thrown into doubt with the failed prosecution of the P & 0 Company following the sinking of the Herald of Free Enterprise, because it wasn't possible to establish that any one of the individual defendants knew the whole circumstances of the provision of safety. This both prevented the allocation of culpability not only to a named and, individual director, but also prevented any corporate responsibility being established. This was also to happen in the case brought against Driver Harrison and Great Western Trains over the Southall crash.

In 1994 The Law Commission proposed a special test applying to corporate liability. The basis of which being the requirement that a company should ensure that its procedures cover any risk reasonably associated with its activities.' It took until the last years of the 20th century that the notion of another offence, of 'corporate killing' began to be considered.

Corporate Killing

According to Bergman a corporation is guilty of corporate killing if:

- a management failure by the corporation is the cause or one of the causes of a person's death; and
- (b) That failure constitutes conduct falling far below what can reasonably be expected of the corporation in the circumstances.
- For the purposes of sub-section (1) above:
- There is a management failure by a corporation if the way in which its activities are managed or organised fails to ensure the health and safety of persons employed in or affected by those activities; and (b) such a failure may be regarded as a cause of a person's death notwithstanding that the immediate cause is the act or omission of an individual.

[Bergman 2001]

The Law Commission considered this and pointed to the possibility of corporations and individuals being liable for corporate killing but their recommendations have been limited to fining companies and specifically stated that officials shouldn't be jailed.

The subsequent Home Office proposals expanded on the Commission's recommendations that a company can still be prosecuted through the prosecution of an individual director or manager, adding that companies and *any other employing organisation* (other than Crown Bodies) will also be able to be prosecuted for the new offence. However, the emphasis is still on the prosecution of companies, rather than individuals. As the Centre for Corporate Accountability has said:

> the government has failed to give sufficient thought and attention to the accountability of company directors. It sometimes appears from the consultation document that the government believes that dangerous systems of safety management within companies take place "spontaneously" - rather than more often than not being the result of conduct on the part of their directors.

[CCA website]

As such it is the centre's view that new individual homicide offences should be introduced but along side this statutory duties relating to safety should be imposed on directors of companies. If these measures were adopted, and the prospect of fines and imprisonment made a distinct possibility it would make it likely that those responsible for safety and the creation of safe systems of work would be required to show that active steps have been taken to implement safe and secure procedures. Failing to do so would result in the company or corporation itself is held criminally liable.

Endpiece

The history of the privatisation of the railways in the UK has been characterised by several bodies and individuals as being a textbook case of how *NOT* to involve the private sector in the delivery of public utilities. This has not only included interested parties, such as passenger groups and trades unions, but also even those within the now defunct Railtrack itself.[487] The principal issues have been the replacement of a single vertical, unitary body, with literally thousands of organisations, each with their own agendas and pressures. The same could be said for their regulators.

Secondly there has been the adoption of a risk management regime that for a number of reasons has failed. Thirdly, there has been the loss of a sense of ownership of the rail system that characterised the post World War 2 period.[488] What is needed above all though is the re-discovery of and the promotion of a safety culture based on engineering, rather than one based on business. In the title of the popular film, we should go "back the future" What Gerald Corbett said in relation to his resignation as Chief Executive of Railtrack , in November 2000 could be said about the railways in general:

"It is time to draw a line in the sand before the industry can go on to the sunlit uplands."

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[487] Confidential interview with senior safety official at Railway Safety, November 2000.

[488] See for example Gourvish; Hall; and Bonavia.

Appendix 1: Research Methodology

> Predicting the future must necessarily be based on knowledge of the past. Future events must have some connection with past events, and this is where historians come in.. Historians can attempt to uncover those elements of the past, which are important, and identify the trends and the problems..Single, specific events are unpredictable, while the real problem or historians is to understand how important they are or could be.
>
> [Hobsbawn 2000: 1-2]

The main thrust of the thesis was to examine the validity of the change in the way risk management was designed and implemented in the years leading up to and following privatisation of the rail network. But it was also intended to make a wider commentary on the adoption of Quantitative Risk Assessment techniques across government departments and associated agencies generally. In the case of the rail industry this was thought to appropriate due to the rich diversity of source material

Case Studies

Case studies aren't confined to one methodological approach, but involve the systematic gathering of information with a view to understanding effectively how its subject operates and functions. (Shaughnessy and Zechmeister, 1990)[489]. In this sense a case study can use a number of data methodologies and technologies, such as among others, documents, interviews and observation.

Case studies afford the opportunity for insights and possibly hypotheses that can then be built upon and developed by subsequent researchers. However in terms of social science two points need to be addressed: objectivity and particularity. The first needs discussion of has the researcher made too many subjective decisions to offer an objective series of results. Of course no research is entirely objective in that even scientific experiments are conducted in an organisational setting. This is even more

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[489] Shaughnessy, J J & Zechmeister, E B *Research Methods in Psychology,* New York, McGraw-Hill

the case though when it comes to the social sciences, where the study of human behaviour is involved. This sense of a lack of objectivity is heightened when qualitative methodologies are employed, although Berg reiterates the point that even a quantitve methodologist that identifies what level of say statistical acceptability, its often based on a subjective decision. For qualitative researchers objectivity is often a matter of being articulate both in terms of explanation and advocacy of methods employed. If the researchers findings and analysis were correct then subsequent research will corroborate them. In the absence of this the integrity of the method relies on internal validity, or triangulation of results.

The second consideration is the degree to which case studies are capable of forming generalisations. Again this is something that exercises the social scientist, but not the historian and this is the subject of a later section when it will be argued that for all their similarities, history and social science are different. However, the next section will consider in greater detail the types of case studies identified.

Intrinsic, Instrumental and Collective Case Studies

Stake (1995) categorises case studies as coming in 3 main forms; intrinsic; instrumental; and collective.

Intrinsic: There are unique and particular cases where the researcher seeks to find out more or understand about a particular case and isn't concerned with generalisations. Here the uniqueness of the subject is the attraction and the purpose isn't to extrapolate results in order to test abstract theory, or develop new theoretical explanations, but to better understand the intrinsic nature of the phenomenon involved.

Instrumental case studies are by contrast designed to provide insight into some issue in order to refine, or comment upon some theoretical explanation. Here the subject is almost incidental and plays a background role to the real concern: the better understanding of the theoretical question or problem.

The third form of case study is the Collective case. These are combinations of the above, where the researcher has several interests and objectives and there is no demarcation line between intrinsic and the instrumental aspects of the research. The present research falls into this category, in that it concentrates upon the rail industry and issues of privatisation, but it also seeks to throw socio-technical theories into relief. It also seeks to examine the utility of the safety case regime, a regime of risk management that is increasingly being advocated by the HSE and involves risk assessment/management techniques as well as regulation and governance issues.

Methods

As already mentioned, the way data can be collected in case studies is rich and varied. It was decided that given the size and complexity of industry that data would be collected and interpreted by means of documentary research, triangulated from other documents and interviews with main actors and commentators in the industry. Some of these interviews were of a confidential nature.

Documentary Research

This is a tradition that is now relatively neglected in the social sciences – although the founders of modern social sciences, such as Durkheim, Marx and Weber drew extensively on them as part of their research. This is perhaps because it implies that no new data is being generated and that to interpret, rather than create data isn't as important and is in a sense a lesser task. However, documents remain an important source of data on human behaviour and activities. They are also the bedrock of any research into the past, which was one of the approaches undertaken in the thesis. In the context of the research, it might be useful to define what a document is.

Documents

> Documents are the returns, statues and proclamations that individuals and groups produce in the course of their everyday practice and that are geared to their immediate and practical needs.
>
> [Scott 1990: 12]

Documentary research can be divided between primary and secondary documents. The distinction being the degree to which the document is contemporary to the source of the data itself. Finnegan (1996) draws the example of Magna Carta. The document itself is a primary source, but commentaries on its significance have been produced in the centuries since. As such secondary sources "copy, interpret or judge material to be found in primary sources." (Finnegan 1996: 141).

Thus Primary sources are the stuff of history, telling us what and why people are thinking and tell us about their views and intentions. Secondary document research is about the commentaries and interpretations of other researchers/ academics on the originals - helping to place them into context, Jupp (1996). This definition covers a whole spectrum of sources. For example, the ones used in the research include: Official Publications, including Government White papers; green papers, or consultation papers; Acts of Parliament; Parliamentary Select Committee reports/ minutes of evidence. Additionally, a plethora of reports and press releases were consulted from Governmental agencies, such as the Health and Safety Executive, (HSE) and Her Majesty's Rail Inspectorate, (HMRI); these being complemented by commissioned reports undertaken by academics and practitioners.

However, these aren't the only documents that can be classified as 'official' and other documents were consulted that could be said to act as indicators, or representatives of organisations. These included individual Company reports/ publications, such as Train Company Reports, Railtrack safety reports etc. Others included Trades union documents; Pamphlets from pressure groups; Reports from Extra Governmental Organisations, (EGOs).

Of major significance here is the use in the thesis of transcripts of Public inquiries to tease out the notion of the socio-technical aspects of disasters. Turner (1978) most notably used this approach in his study of public inquiries in order to formulate a socio-technical model for disasters, (see Chapter 3). Turner's work was added to by Toft's model for organisational learning to create the Turner-Toft model, (see Turner-Pigeon, 1997).

This research emulates this approach in the use of material and testimony from public inquiries into the Clapham Junction, Southall, and Ladbroke Grove. However, it doesn't seek to establish the causation of individual disasters in an attempt to relate them to the Turner-Toft model, but to establish the principal of organisational complexity as evident in the rail industry on the lines of Perrow's theory, 'Normal Accidents', (see Chapter 3). Thus the complexity of the system contributed to the disasters and the balance between human and technical factors in accident causation and how the two elements relate to each other.

Secondary sources included reports from the newspapers and the media; Papers presented at industry and academic conferences.

The great advantage of Documentary research is that it is a very time and cost effective way of conducting research and collecting data. This enables the researcher the chance to extend his/her studies much wider than through other approaches; making for a more extensive and often efficient project, by avoiding many of the logistical and practical problems associated with other forms of research.

Secondly because it is an 'unobtrusive' form of research it can avoid many of the problems of bias that for example compromise research based on the It can also avoid any of the practical problems associated with other forms of research, such as the behaviour and attitudes and researcher constructing research instruments, such as interview schedules and questionnaires. As Webb pointed out:

Today, the dominant mass of social science research is based upon interviews and questionnaires. We lament this over-dependence upon a single, fallible method. Interviews and questionnaires intrude as a foreign element into the social stetting they would describe.

[Webb 1966:1]

The great disadvantage is of course that documents are sources that are produced from beyond the researcher's control. This leads to a situation where the researcher is reacting to existing data when forming hypotheses and theories, rather than the favoured method in social sciences of forming them first before testing them with data. In particular it has been stated that documents far from being objective are essentially social constructions of the organisations that produce them. As Finnegan states:

All sources do not just arise automatically through some process of nature [but are] results of human activity. They are produced by human beings acting in particular circumstances and with in the constraints of particular social, historical or administrative conditions

[Scott 1990: 143].

This is very much the case with for example the production and preparation of official documents, again Scott:

Official documents are shaped by the structure and activities of the state, both directly and indirectly... they are often the by-products of policy and administration and interests of state agencies.

[Scott 1990:59]

A long running example of this in social sciences is the controversy over the use of official statistics by researchers. Thus Bulmer (1977), cites the case both for and against their use, concluding that whatever the merits and drawbacks, the researcher should be aware that as with other official documents that they are set in their own social and political context and organisational meanings and agenda. (By way of example in the rail industry the distinction between major and minor accidents was abolished and replaced with a single measure of reporting that involves the person being taken to hospital.)

In this respect, the data needed to be subject to independent corroboration, through a process of triangulation. Deconstructing the documents referred to did this, in order to establish their utility as source material.

Deconstructing Documents

In the light of this recognition that documents are social processes and the researcher has to assess documents and to deconstruct them for meanings a number of issues have to be assessed. Scott [1990] summarises these under the following headings of authenticity; credibility; and the degree to which they can said to be representative and to carry meaning.

The document's authenticity will be increasingly problematic the farther back in history you go. In this case, the study was concerned primarily with events since 1979, and in the rail industry from 1987 – 2001. This meant that most of the documents consulted were contemporaneous to the events and actions described. For example, Select Committee reports on the Rail industry were published within months of evidence taken. It was also possible to assess any conclusions drawn by cross-referencing with the evidence as available in separate publications and via the Internet. Similarly, reports on disasters from the Health and Safety Executive, (HSE) were produced in a reasonable time frame. This meant that again any cross-referencing could be undertaken reasonably easily by interviewing the authors concerned, (see below).

The second element in establishing utility is to establish its credibility. Given that documents are a prIori selective representations of data etc, there needs to be some examination of how and by what processes the document has been assembled. These would include both the production of official statistics and transcripts of Public Inquiries. This will serve to place into relief the data arising from them. The same can be said of information from Select

Committees. Again this was the subject of interviews with representatives of the organisations involved.

The third aspect when deconstructing documents is to assess the degree to which they can be said to be representative. This can be slightly problematic because in some historical research, documents are simply not available, or a single document can contribute a great deal in informing research. However, again this wasn't so much of an issue in this research because of the sheer volume of documents that arose from different sources, (see bibliography). Additionally, during the research itself there were two major train crashes - Ladbroke Grove and Hatfield - and no fewer than four public inquiries and criminal and civil prosecutions pursued, providing fresh points of context for assessing. Additionally, they have been augmented by reference to reports into significant crashes from the 1970s onwards.

The final aspect of utility is to ascertain a sense of a document's meaning. This leads to the idea that data from documents should be checked not only from other documents, but preferably also from at least one angle, by the process of Triangulation.

Triangulation

Porter (1994) traces the idea of triangulation in the research process to the concept as used in surveying and navigation. Thus:

> The navigation analogy is more accurate, referring to the process whereby a position is 'fixed' using, preferably, different kinds of measures, for example compass bearings, depth surroundings and radio bearings..... the underlying idea is that the wider the variety of evidence you can bring to bear, the smaller the area of doubt.
>
> [Porter 1994: 70]

Denzin (1970) put this in more specific terms for the social sciences when he stated it to be: *'The combination of methodologies in the study of phenomena or the use of multiple methods.'* Amplifying this statement he characterised triangulation as being possible from using the same methodology – in this case by reference to other documents (see the above section), and from using a different methodological approach to establish the validity of any conclusions. As Porter continued:

> It is less a case of checking a 'fact' collected by one method, using another method, than using one method and then justifying the results by another.
>
> [Porter 1970: 70]

Triangulating data from the sources referred to was done by reviewing secondary sources and by undertaking fieldwork in the form of interviews with experts and operators; regulators; political lobbyists; campaign /pressure groups and lawyers in the field.

Interviews

Cohen and Manion explain the role of interviews as serving three purposes. Firstly, as the principal means of gathering data. Secondly, in order to test hypotheses or to explore new ones. The third reason was to triangulate existing data gathered by other methods. This research aimed to use them for the second and third reasons.

The interviews themselves ranged from academics, politicians, civil servants and most crucially practitioners. Thus officials from Train Operating Companies; Railtrack; Regulators; Unions; Lawyers and pressure groups were approached with a view to gathering their views on safety in the industry and to illuminate sources produced by their respective sources. The approach being one of 'snowballing' whereby issues raised at one interview were used to inform subsequent ones, in a reflexive exercise.

Semi- Structured interviews

Once it was decided to interview selected participants and commentators, the next decision was which form should these take. Cohen and Manion (1996) identify four forms: the structured; the semi-structured;

the non-directive interview; and lastly the focused interview. Standardised interviews are formal in that the wording and order of the questions are standard for all subjects.

The semi-structured interview are much more open in their nature, in that the interviewer is given more latitude in the direction in which the interview can go; enabling him/her to raise issues in response to the interviewee's responses. Semi-structured interviews typically involve creating a framework by way of a limited number of major leading questions, directed to all of the subjects. The idea being to analyse the broad areas of coverage in the subjects to be raised, but to allow their interpretation and identification of the main issues involved.

However, they both have in common the dominant role they afford to the interviewer. In contrast, the non-directive interview allows interviewees, or the subjects, to express themselves as freely as possible, with minimal intervention from the interviewer. The last form of interview is the focused interview whereby the subject is allowed to express him/herself as freely as possible but in terms of a situation that has been pre-determined by the interviewer. Both this approach and the non-directive interview have their origins in psychiatric interviewing.

In the light of the subject and the relative homogeneity of the subjects, (i.e. that they were experts in some aspect of the rail industry, or the legal and academic professions), it was decided that the principal choice would be between the structured and the semi-structured approach. The standardised interview could have been conducted relatively easy with experts and practitioners as they exhibit the same meanings when discussing phenomena even if they disagree on their conclusions. However, in the context of discovering issues such as for example, the utility of the safety regime in the industry, this would have only replicated information already gleaned from documentary evidence, without placing it in context. Thus it was decided to concentrate on the semi-structured approach.

In this area it allowed the subjective aspects to be aired by, for example, airing opinions and raising points not previously considered. In time this allowed subsequent interviews to be informed by those already completed.

One avenue that was explored in the interviews was the role of public inquiries in bringing out salient points in the research.

Public inquiries

As previously stated the use of data arising from public inquiries constituted a significant part of the research. In order to place such information in Public Inquiries in their proper context, a critique of their format and procedures was undertaken again using data extracted from subjects involved and associated commentaries. Additionally, the researcher used observational exercises as the final aspect of the triangulation process.

Observation

In addition to interviewing experts in the field of Public inquiries, the researcher attended public seminars conducted in conjunction with the relevant public inquiries. Robson (1993), points to the advantage observation can give to triangulation in allowing subjects to express their views directly without the researcher interceding, or tainting the collection of data with his/her pre-conceptions. The principal form of observation used in the thesis was non-participant, rather than the more usual participant observation approach. Thus whilst public observers were allowed to ask questions of the participants, this was mediated through the seminar's chairman. Also, whilst the seminars allowed the researcher to observe subjects that he had been previously interviewed and was thereby afforded the opportunity to assess data already collected, the seminars themselves were highly structured and directed by the seminar secretariat, in the form of pre-ordained questions. This meant that triangulation was limited and indirect. That said the areas of discussion were of great significance for the research and issues raised were to a large degree concomitant to the research.

The decision to adopt an eclectic approach to the methods was deliberate given the need for triangulation. However, it proved to provide an extra advantage given the events that occurred during the research and writing of the project. In particular, the Ladbroke Grove and Hatfield disasters proved to be a rich and valuable source, something that would have been circumscribed if one methodology had been used.

Appendix 2: Public Seminars, Cullen inquiry Part 2

In parallel with the formal hearings for Part 2 of LGRI, the Inquiry held a series of one-day seminars.

The seminars were seen as an opportunity to widen the debate, and to:

- facilitate discussion of specified topics, for the purpose of identifying areas
- of general agreement or which are contentious
- identify key issues which may merit particular attention in Part 2
- stimulate thought and discussion, and provide a forum for the expression and debate of views and ideas
- enable individuals and organisations not present at or witness to the Inquiry to express their views in a public forum

The idea of holding seminars followed the successful examples of both Lord Justice Woolf's Inquiry into prison disturbances and the Bristol Royal Infirmary Inquiry. At each seminar an invited group of participants identified and considered the key issues related to a particular topic. As well as providing a forum for debate the seminars provided an opportunity for individuals and organisations who were not represented at or witness to the Inquiry to express their views, and contribute to the work and objectives of the Inquiry.

The seminars were chaired by Robert Owen QC, Counsel to the Inquiry. Lord Cullen and his assessors (Professor Peter McKie and Malcolm Southgate) attended subject, in Lord Cullen's case, to commitments arising from the Joint Inquiry into train protection systems.

Seven seminars were held or planned, dealing respectively with:

Passengers' Persepective on Safety – September 20th

The CAA approach to Regulation - Wednesday 27 September

The Japanese Approach to Safety - Monday 16 October

Employees Perspective of Safety Wednesday 18 October

The regulatory authority - Monday 30 October (*seminar cancelled*)

Safety Culture- Friday 17 November

Management of Change- Monday 20 November

Appendix 3: Rail Disasters 1982-2002

This is a resume of the fatal train accidents on the rail network from 1982 –2002. This list is taken from Evans A W (2000). The details below relate to the original crash the degree set out to study – Southall 1997 – as well as those that occurred in the course of the research. The summaries are taken from HSE reports and press releases.

Date	Location	Nature of Accident	ATP Preventable	Fatalities
19/09/97	Southall	Train collision	Yes: SPAD	7
8/8/96	Watford Junction	Train collision	Yes: SPAD	1
8/3/96	Rickerscote	Derailment/ collision	No	1
31/01/95	Ais Gill	Derailment/ collision	No	1
15/1094	Cowden	Train collision	Yes: SPAD	5
25/06/94	Branchton	Derailment	No	2
13/11/92	Morpeth	Train collision	No	1
27/07/91	Newton	Train collision	Yes: SPAD	4
08/01/91	Cannon Street	Buffer Collision	Yes: Over run	2
04/08/90	Stafford	Train collision	No	1
20/04/89	Holton Heath	Train collision	No	1
06/03/89	Bellgrove Junction	Train collision	Yes: SPAD	2
04/03/89	Purley	Train collision	Yes: SPAD	5
20/02/89	Warrington	Train collision	No	2
12/12/88	Clapham Junction	Train collision	No	35
11/11/88	St Helens	Derailment	No	1
19/10/87	Glanrhyd Bridge	Collapsed Bridge	No	4
19/09/86	Colwich	Train collision	Yes: SPAD	1
09/03/86	Chinley	Train collision	No	1
04/12/84	Eccles	Train collision	Yes:SPAD	3
03/12/84	Longsight	Train collision	No	1
11/10/84	Wembley	Train collision	Yes: SPAD	3
30/07/84	Polmont	Derailment	No	13
03/02/84	Wigan	Train collision	No	2
09/12/83	Wrawby junction	Train collision	No	1
03/02/83	Elgin	Derailment	No	1
09/12/83	Lindslide	Derailment	No	1
27/05/83	Alvechurch	Train collision	No	1

Train Crashes that have occurred since the beginning of the research and the originally intended focus of attention, Southall.

Southall 19/09/1997

A rail collision occurred at about 1315 hours on 19/09/97 at Southall East Junction, West London between the 1032 Swansea to Paddington HST operated by GWT and a freight train operated by EWS. The collision resulted in the death of seven passengers on the HST and many injuries. Extensive damage was caused to the power car and leading coaches of the HST and the trailing freight wagons, with further damage being caused also to the track and to Overhead Line Equipment.

Ladbroke Grove (Paddington) 05/10/99

The accident, occurred at 8.09am on 5 October, when a Thames Train 3-car turbo class 165 diesel unit travelling from Paddington to Bedwyn, in Wiltshire collided with a Great Western High Speed Train (the "HST") travelling from Cheltenham Spa to Paddington. The accident took place 2 miles outside Paddington station, at Ladbroke Grove Junction. 31 people died (24 from the 165 and 7 from the HST), with a further 227 taken to hospital. 296 people were treated for minor injuries on site.

Hatfield 17/10/00

On 17 October 2000, the 12.10pm train (1E38) Kings Cross to Leeds passenger express train departed from Kings Cross, it was due to arrive at Leeds at 14.33pm. At 12.23pm, the train, operated by Great North Eastern Railway (GNER), and travelling at approximately the line speed of 115 mph, derailed roughly 0.5 miles south of Hatfield Station (approximately 16.8 miles from Kings Cross). No other trains were involved.

The train was an Intercity 225 hauled by a Class 91 locomotive. It comprised of one Class 91 locomotive, 8 Mark IV passengers carriages, a buffet car, and Driving Van Trailer (DVT). There were 10 GNER staff and around 100 passengers on the train. As at 19 October, 4 passengers have been confirmed as dead, and 34 others suffered injuries.

Great Heck 28/02/01

On Wednesday 28 February 2001, the 04h45 Great North Eastern Railway (GNER) passenger train left Newcastle on route to London Kings

Cross. At approximately 06h12, while it was still dark, a Land Rover pulling a trailer loaded with a Renault car left the west bound carriageway of the M62 motorway at Great Heck, between junctions 34 and 35. The Land Rover and trailer continued along the steep road embankment and subsequently down a railway embankment and came to rest, fouling the Up mainline, on the south side of the M62 over-rail bridge at a point located at about 170 miles from London up the East Coast Main line (ECML

The road vehicle driver survived the incident and made a telephone call to the emergency services. As he was talking to the emergency services (at about 06h14), the south bound GNER express passenger train struck the Land Rover. The train, which was travelling at around the line speed of 125mph, was an Intercity 225 propelled by a Class 91 locomotive and consisted of a leading Driving Van Trailer (DVT), eight Mark IV passenger carriages, and a buffet car. The DVT became derailed at a point approximately 15 metres to the south of the impact and then travelled in a derailed condition, staying substantially in line and upright, for approximately 700 metres until it reached a set of points associated with sidings. 13 people were killed.

Potters Bar 10/05/02

The rear coach of a four coach commuter train, bound for Kings Lynn from Kings Cross, derailed passing over points No. 2182A just before Potters Bar station. The coach detached from the others and came to rest on its side wedged under the canopies of the station and bridging adjacent platforms The other three coaches remained upright, travelled on through the station and were brought to a halt around 400 metres north of it. At the time of the accident the train was travelling just below the speed limit for this Class which is 100mph. 5 people were killed.

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Appendix 4: ATP and AWS and TPWS: Extract from a paper by the Rail Forum.

Automatic Train Protection (ATP).

ATP is a system involving both equipment on the track which transmits target speeds to trains, and in the cab which displays the speeds and checks that the train is not exceeding them. The speeds are the safe speed at the entry to a block of track.

Advantages of ATP

- Trains are constantly fed with information regarding the speed that is safe at the start and end of each block section.
- Presents safe speeds to the driver
- Guarantees that all trains will be stopped before a red signal
- Protects trains against exceeding speed limits.

Disadvantages of ATP

- Mores expensive than TPWS and likely to take longer to install
- Some ATP systems reduce line capacity by about 25%, therefore disliked by some railway management
- Problems in fitting to trains not designed for it.
- Some drivers dislike the loss of responsibility implied by a system that tells them the safe speed to drive at.

Automatic Warning System (AWS).

AWS is provided to give an audible warning and a visual reminder of the aspect displayed by signal. If the signal being approached is clear (green) a bell sounds in the cab and the visual reminder is cleared. If the signal is not clear - red, yellow (next signal is red) or double yellow (next signal is yellow) - a hooter or buzzer sounds in the cab and the visual indicator is set to indicate that the last signal passed was not clear. Apparatus under a ramp between the tracks contains a permanent magnet and an electromagnet. If the electromagnet is not energised, it indicates that the signal being approached is not clear. The system, in common with most rail equipment, thus the electromagnet can only give two indications, hence the main limitation of AWS - it gives the same warning for red as for yellow or double-yellow signals.

Train Protection and Warning System (TPWS)

A recent British development which is currently scheduled to be fitted to most lines in Britain within the next five years. Two sets of two electronic loops are set in the track before signals where a SPAD would be most likely to put a train into risk of being involved in a collision. The loops are energised when the signal is red and emit electromagnetic fields. When an antenna on the train detects the field emitted by the first loop of a pair it starts an electronic timer. The field emitted by the second loop of the pair stops the timer. The first pair of loops encountered are spaced so that the timer on the train can calculate whether the safe speed for approaching the signal is being exceeded. If it is, the brakes are automatically applied. The second pair of loops are situated closer to the signal and are placed very close together such that the safe speed is effectively zero. TPWS will be used in conjunction with the existing AWS.

Advantages of TPWS

- Much more effective than AWS or preventing SPADS because it only becomes effective on approach to a red signal and cannot be cancelled by the driver. AWS is still warns of double yellow and yellow signals so the driver should have slowed the train before the first pair of loops is encountered.

- Much cheaper to install than the alternative more sophisticated ATP.
- Quicker to install than ATP
- Easier to install on trains than ATP because the new train-born equipment can interface to the existing AWS equipment.

Disadvantages of TPWS, compared to ATP.

- It will only be installed at the most dangerous signals.
- The speed-checking loops are at a fixed position before the signal. They can only be set to one speed. This means that a train could pass them at a much higher speed and the train would not be stopped before the safety overlap beyond the red signal. The loops would normally be set for a speed of 75 mph. Many passenger trains, and some mail trains, travel much faster than that.
- Because of the above issues, it has been calculated that TPWS would prevent only 60% of accidents caused by SPADS

Appendix 5: Safety Cases.

Each company seeking to operate on the railways are required to meet certain criteria as determined by HMRI and inspected by Railtrack. These are some of the main issues involved in gaining a successful certification. These are taken from Evans and Horbury, (1999.)

1. The name and address of the operator
2. A description of the operation
3. A description of the premises or plant to be operated
4. Particulars of any technical specifications and of operating and maintenance procedures
5. Statement of the Health and Safety policy
6. Statement referring to findings of a risk assessment
7. Particulars of the operator's safety management system
8. Details demonstrating that the operator has adequate arrangements to implement a safety policy and that staff are competent
9. Arrangements for the dissemination of information on safety matters to employees
10. Arrangements for consulting employees
11. Arrangements for accident investigations, if necessary in co-operation with other operators
12. Arrangements for ensuring the safety of contractors employed by the company
13. Arrangements for dealing with accidents and emergencies
14. For station operators measures for dealing with overcrowding and evacuation
15. Safety procedures in the design and procurement of premises and plant
16. Arrangements for a safety audit
17. Arrangements for co-operation with other operators on safety matters

Glossary of Selected Personnel

Appleby, M, Thompsons Solicitors, and legal representative for ASLEF and Larry Harrison at trial and Public Inquires.

Baldry, J, Professor, Stirling University

Caplin, Jonathan, Legal Representative for Great Western Trains, Southall Inquiry.

Coleman, Victor, Chief Rail Inspector, HMRI.1998-2001

Cooksey, A, Representative for HSE/HMRI, Southall Public Inquiry. Witness for HSE/HMRI, to the Ladbroke Grove Pubic Inquiry and the UFF/Cullen Joint Inquiry.

Cope, J, Consultant to WS Atkins.

Corbett, Gerald, Chief Executive Railtrack, 1999-2001

Cullen, Lord John, Chairman*, Piper Alpha Inquiry, 1989; Inquiry into Ladbroke Rail Accident, 2000;* Joint Chairman *into Joint inquiry into Train Protection Systems, 2000-2001.* Chairman, *Ladbroke Grove Part 2 Inquiry.*

Custance, T, Herbert Smith, Solicitors, Legal Representative to AMEY at Southall and various Public Inquires.

Garnham, N, Counsel to Cullen Inquiries, 2000-2001.

George, Richard, Managing Director, Great Western Trains, 1997-1999

Leeper, Tom, Legal representative for British Transport police, Southall inquiry, 1999.

Muttram, Rod, Chief Executive of S&SD, Railtrack/ Railway Safety, Railtrack Group. 1997-

Nicholas, P, Assistant Chief Constable, BTP.

Owen, R, Counsel to the Cullen Inquiries, 2000-2001.

Satchwell, G, SIO, Southall crash, Detective Superintendent, BTP 1997-2000.

Smail, R, Risk Management Consultant for Det Norske Veritas, and commissioned by the Cullen Inquiry to examine the WS Atkins report for Thames Trains on CBA.

Uff, Professor John, QC, FREng, Chairman, Southall Rail accident Inquiry 1999-2000; Joint Chairman.

Wheeler, C, Balfour Beatty, Contractors.

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