Feature

Accidents Raise Fears about Britain's Fragmented Railway

Richard Hope

Introduction

Following the example of Japan and some other countries, the British government announced in July 1992 that British Rail (BR) was to be privatized. What made the British formula for introducing private enterprise and competition to a state-owned national railway unique was the way train operations were to be divided among some 30 private companies, with more companies responsible for the ownership and maintenance of rolling stock. Initially, the national infrastructure of tracks and stations was to remain in public ownership through a single organization, Railtrack. During the privatization this policy changed, and Railtrack was successfully floated as a joint stock company in May 1996. Apart from appointing an independent Rail Regulator, the government retained no rights to the land on which the 16,600 km network was built, for example through a 'golden share.'

Fragmentation of the previously unified BR management structure was not only applied to train operations. All the physical work of maintaining and renewing the track, bridges, signalling, electrification, etc. was transferred to contractors. These were formed initially by dividing up the BR workforce previously managing and undertaking these tasks. With the exception of signallers who controlled train movements minute by minute, and some 500 timetable planners, Railtrack's 11,000 staff were essentially confined to planning, managerial and monitoring roles.

Railtrack's first chairman, Sir Robert Horton, then compounded the fragmentation process by deciding that most of the intellectual work should also be contracted out to consultants. In its final year, Railtrack spent 10% of its total turnover—some $500 million—on consultants' fees. This policy applied in particular to professional engineers—a decision that was to prove disastrous not just for Railtrack but for the rail industry as a whole, as we shall see.

Five Fatal Accidents Since Privatization

The privatization process commenced in April 1994 with of BR into Railtrack and up to 100 shadow companies ready to be sold. Privatization was effectively complete when the last passenger franchise was let in March 1997. During this period there were many forecasts of a decline in rail safety. It was widely claimed that fragmentation of management, coupled with the departure of thousands of experienced engineers, operators and supervisors, would lead to more accidents.

So far as the media were concerned, this forecast appeared to be borne out by a series of five dramatic collisions and derailments that occurred, starting in the same year that privatization was completed. These are the basic facts:

Southall: Remarkably, the driver of this HST was not seriously injured when it struck the hopper wagons. The AWS was working in the undamaged rear cab. (K. Brunt)

Southall on 19 September 1997

An HST intercity diesel train set from Swansea to London Paddington running at the maximum speed of 200 km/h on the Great Western Main Line (GWML) passed two warning signals when only 15 km from its destination because the driver was distracted. He saw the red signal but it was far too late. The HST collided on points with empty hopper wagons at the rear of a train that was correctly crossing the up main line. The driver had reduced his speed to 110 or 120 km/h, and the combined speed of the two trains on impact was probably around 140 km/h. The HST driver survived but seven passengers were killed. Both the Automatic Train Protection (ATP) system and Automatic Warning System (AWS) on the HST were switched off.

AWS is installed throughout Britain's rail network. As a train approaches each signal, the driver will either hear a bell if it is green (clear), or a horn if it is yellow (warning) or red (stop). The horn also sounds where a speed reduction of more than 33% is required. If the driver fails to cancel the horn within 5 s, the brakes are applied automatically. ATP is a general term used to describe more complicated systems, of which there are many types, that prevent the driver passing any stop signal or exceeding any speed limit. One such system was fitted to Great Western HSTs on 140 km of the GWML nearest London, but it was still officially under testing in 1997.

Ladbroke Grove on 5 October 1999

Also on the GWML but only 3 km from Paddington, the inexperienced driver of a three-car diesel-multiple unit (DMU) passed a signal at red without realizing he had done so. About 700 m further on, and still accelerating, he was routed on to the up main line where he immediately collided head-on with an identical HST to the type involved at Southall—indeed, it even contained some of the same coaches. The combined impact speed of the two trains was 210 km/h, the highest in world railway history. The front car of the DMU completely disintegrated with longitudinal welds failing so that the aluminium extrusions forming the body tore apart. The fuel tanks collapsed atomising the diesel oil causing fireballs that entered some carriages. Both drivers and 29 passengers were killed, with some survivors severely burned. The BR standard AWS was operating on the DMU, but AWS does not stop the train if the driver acknowledges each warning at yellow signals.

Hatfield on 19 October 2000

Apart from the GWML out of Paddington, there is only one other trunk route radiating from London with a line speed of 200 km/h—the East Coast Main Line (ECML) linking London Kings Cross with Edinburgh. The Great North Eastern Railway operates IC225 trains (so called because they were originally intended to run at 225 km/h) using a dedicated fleet of electric locomotives in push-pull mode. An IC225 with leading locomotive derailed 27 km from Kings Cross when the outer rail in a curve disintegrated under the train, which was travelling at 185 km/h. The buffet car turned over and the roof was sliced open by an electrification support, killing four passengers. The rail had been severely affected by rolling contact fatigue at the gauge corner. A 36-m length shattered into pieces, none of which was more than 1-m long; some 300 rail fragments were recovered from the crash site.

Great Heck on 28 February 2001

Also on the ECML but 269 km from Kings Cross, an early morning IC225 being pushed by the same locomotive that was involved at Hatfield struck a Land Rover that had smashed its way through the fence onto the track from an adjacent field. The driver of the Land Rover, which was hauling a car on a trailer, had fallen asleep and driven off a motorway, down an embankment into the field, and then onto the up line. There was a crash barrier alongside the motorway, but the driver left the motorway before reaching it. The leading vehicle of the IC225 containing a driver's cab and luggage space was partially derailed, but travelled for some 600 m until it was deflected by points onto the down line. Almost immediately, it collided more or less head-on with the locomotive of a coal train at a combined impact speed of around 270 km/h, some 60 km/h higher than at Ladbroke Grove. The leading car was totally destroyed and the coaches scattered in an adjacent field, killing six passengers and four railway staff.

Potters Bar on 10 May 2002

The final accident in this series was only 6 km south of the Hatfield accident site on the ECML, but involved a four-car electric multiple unit (EMU) running through Potters Bar Station on the down fast line at close to its maximum speed of 160 km/h. While running over facing points in a crossover to the down slow line, one of the switch blades broke free from the point locking stretcher, causing the last three bogies to derail. The first three cars came to a stop with little damage, but the fourth spun round through 90° and was arrested when it jammed under concrete awnings on the two island platforms. Six passengers died and a woman walking under a bridge was killed by falling debris. Examination revealed that the points had been seriously distorted by forcing the two switch rails apart after nuts had been removed or had fallen off both the front and back stretcher bars. Only the relatively weak locking stretcher still connected the two switch blades, and this failed from fatigue.

Railways are Not 'Less Safe'

All five of these accidents generated worldwide media coverage, with widespread attempts to link them to privatization and apportion blame to particular companies. This view still prevails. For example, The General Secretary of the Fire Brigades Union, whose members have to rescue people in rail accidents, referred in a speech on 9 September 2002 to 'the mangled wreckage of the all-too-regular train disasters wreaked upon us through the madness of the failed privatization.'

The result is a public and media perception that the national railways have become less safe than they were under BR. I will demonstrate in due course that this is certainly not the case. Even quite trivial incidents that would pass unremarked on the roads, such as a collision with buffer stops at 5 km/h, provides a story for national newspapers. But media hype goes off the scale when passengers on a train are killed as a result of a collision or derailment.

Note that hereafter I will be using the expression 'fatal train accident' in the strict technical sense that it is used in British safety statistics. Train accident injuries or fatalities refer to passengers and staff actually on the train, or third parties struck by derailed vehicles or flying debris. It does not apply to people killed

Figure 1 Fatal Train Accidents on the National Rail Network

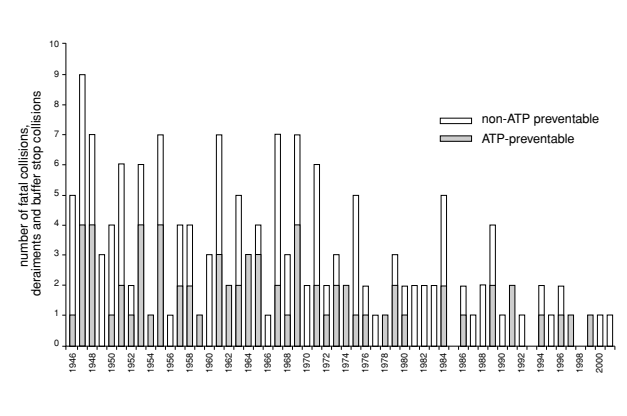
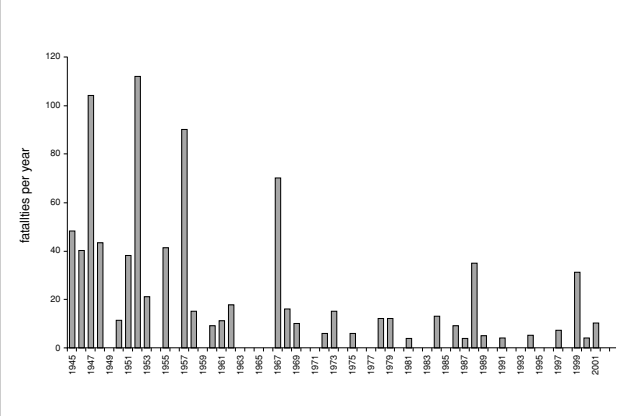
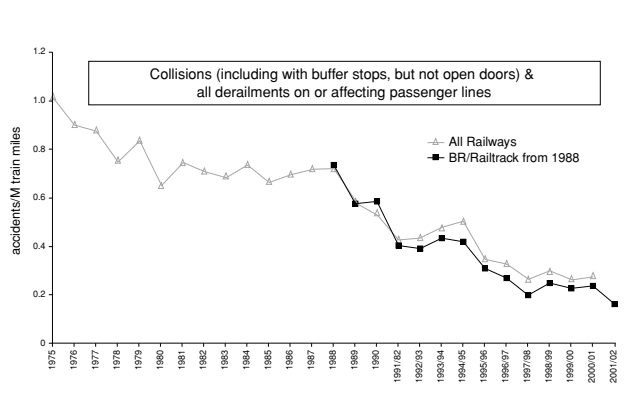


Figure 2 Passengers and Staff Killed in Train Accidents with More Than Three Fatalities



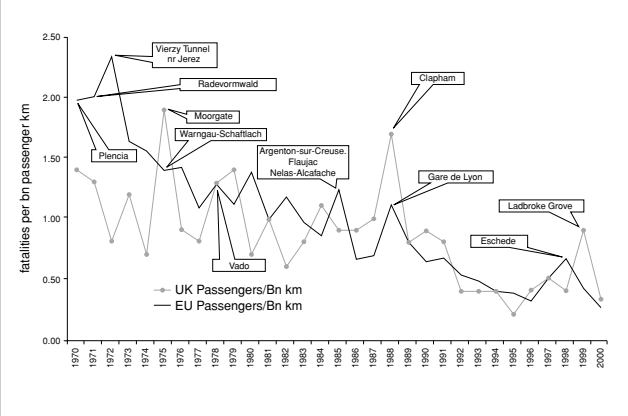
Source: HMRI excluding non-BR train accidents

Figure 3 Significant Train Accidents (STA) Rates for All UK Railways and for BR/Railtrack Since 1988



Sources: HMRI Annual Report, except 2001/02 which is estimated on HMRI basis.

Figure 4 British Passenger Fatality Rates Compared to Whole European Union



Sources: UIC for EU figures, TSGB for UK Railways, P. Semmens *Railway Disasters of the World*, 1994.

in road vehicles or just walking across level crossings, passengers who fall down stairs or on to the track at stations, and workers, trespassers or suicides who are hit by trains, and other suicides.

The impression that the number of train accidents has increased since privatization is false. The fact is that there were 10 fatal train accidents on the BR/Railtrack network in the last 10 years, compared to 21 in the 1980s and 23 in the 1970s.

Figure 1 divides these train accidents into two groups—those that would have been prevented by full automatic train protection (shaded), and other causes (open). The long-term falling trend since 1946 is quite clear. It is pure chance that all five fatal train accidents that have occurred since 1997 had death tolls ranging from four to 31, whereas the previous five had less serious consequences. The worst of these was a very destructive head-on collision between two DMUs at Cowden on 15 October 1994. Three train crew were killed, but because it was 08:00 on a Saturday, and not a working day when many commuters would have been on board, only two passengers died.

Figure 2 shows total fatalities in those train accidents where four or more people died, including railway staff. Again, the trend is quite clear.

The Potters Bar accident is missing from both figures because the data are taken from the most recent annual report of Railway Safety, whose status is discussed later. At the time of writing, Railway Safety is still nominally part of Railtrack, although with a high level of independence. Unlike Her Majesty's Railway Inspectorate (HMRI), now part of the Health & Safety Executive (HSE), Railway Safety's data applies only to the national main-line network and excludes other operators, by far the most important being London Underground.

For many years HMRI has used 'significant train accidents per million train-miles' (STA rate) as the primary indicator of external risks faced by passengers, which are outside their own control. This is opposed to personal risks, such as getting drunk and falling off a platform. Figure 3 again shows that the trend is downwards and the year ended 31 March 2002 was the best ever.

Finally, Railway Safety compared UK fatality rates for rail passengers with those for the European Union as a whole (Fig. 4). International rail safety data is difficult to interpret because of differences in reporting rules, and inevitably there are large year-to-year variations. However, it is clear that Britain's railways were better than average in the 1970s, and are now very close to the EU average in terms of passenger deaths per passenger-km travelled.

Accidents to Individuals

It has to be remembered that train accidents account for only a small proportion of total injuries and deaths on the railway, even if suicides are excluded on the grounds that if trains were not available, people would find other ways to kill themselves. In its final years, BR made major gains in overall safety through two initiatives that had nothing to do with preventing collisions or derailments.

BR had been slow to introduce powered doors, compared to other railways. Production of commuter trains with crude doors swinging outwards like an 18th century stagecoach did not cease until the mid-1970s. Indeed, intercity trains were still being produced with these 'slam doors' up to the mid-1980s. Each year about 20 people (including some suicides) were killed when they opened these doors between stops and fell out.

A programme to fit remotely operated bolts to the doors on intercity trains (which accounted for most fatalities) was completed about 10 years ago at a cost of around $30 million. This brought the death toll down to around three per year and has saved more lives than would be achieved by totally eliminating train accidents on Britain's railways.

A similar programme saw deaths among workers on the track (including train crew) fall from around 40 a year in the 1970s to an average of three in the mid-1990s. Unfortunately, the numbers have begun to creep up, perhaps due to the unfamiliarity of contractors' staff with the hazardous on-track environment.

To sum up, the evidence is quite clear. Despite five serious accidents since 1997, virtually all statistical indicators except those associated directly with train accident fatalities continue to show a historically low and improving trend. This includes STA rates, which halved between 1991–95 and 1997–2002, representing the periods immediately before and after privatization.

High Profile of Five Accidents

We have seen that Britain's railway network is broadly as safe as it ever has been in terms of the chances of being killed as a passenger, rail worker, or motorist using a level crossing. However, the fact remains that five destructive accidents in just over 5 years have created a public and media perception of rail travel as risky, even though it is far safer than travel by car.

Each time a multi-fatality accident occurs, the hunt is on to find and punish the culprits within the complex structure of the privatized and fragmented railway. Recently, this has resulted in consulting engineers being refused liability cover by insurance companies for any work they do in relation to railways.

An early manifestation of this malaise was a huge increase in the clear-up time after an accident. The change was first apparent at Southall, but it was Ladbroke

Grove that shocked the industry. London's Paddington terminus was completely closed for 16 days despite the fact that the relief (slow) lines were hardly obstructed by the wreckage.

Hatfield was even worse at 23 days, again with two of the four tracks clear of obstructions apart from fallen catenary wires. Now, the police declare the site of even minor low-speed derailments a 'crime scene' where nothing can be moved until searches for evidence are conducted by police officers. After Hatfield, it was reported that pieces of ballast were being recovered for forensic examination! Passengers have been virtually imprisoned for hours on a derailed train, and literally hundreds of statements may be taken in the course of an inquiry.

Nor are the police solely to blame. At Hatfield, the line remained closed for several days longer than necessary because HMRI demanded that the severely damaged (and therefore structurally weakened) buffet car be removed intact for examination, instead of being cut up on site. This was apparently to determine why the roof had been sliced open by the electrification support that it struck at around 160 km/h. Adding to the sense of high drama was the decision after Southall to hold a full public inquiry lasting several months, at which hundreds of hours of evidence—much of questionable relevance—was heard. The whole process was repeated after Ladbroke Grove on an even larger scale, with no fewer than three separate reports emerging. One covered the accident itself, another dealt with train protection issues, while the third recommended a new and more elaborate structure for regulating safety.

The policy changed after Hatfield. Now we get no public inquiry of any kind, and interim reports from HSE say as little as possible about the reason for the accident because they might prejudice continuing police investigations. Criminal prosecutions are still pending on Ladbroke Grove, Hatfield and Potters Bar. In contrast, the driver of the Land Rover was prosecuted for Great Heck and is now in prison.

As to the causes of the accidents and what could be done to prevent them happening again, it was fairly obvious that not much could be done to stop road vehicles driving from a field on to the railway, as happened at Great Heck. The other four fall into two categories: driver error and track faults.

Automatic Train Protection

It so happened that both train accidents that killed passengers prior to Southall, including Cowden and another at Watford Junction in August 1996, were caused by 'signals passed at danger,'—known even to the general public as SPADs after Ladbroke Grove. Automatic train protection became a political hot potato, with the amazing spectacle of demonstrators on London's streets shouting 'What do we want? ATP! When do we want it? Now!'

It quickly emerged after the collision at Southall that the HST was equipped with ATP, as was the GWML and the non-stop *Heathrow Express* trains connecting the airport with Paddington. Like all British trains, the HST was also fitted with the 1950s AWS.

Either system should have prevented the accident, since the driver was only temporarily distracted and would almost certainly have reacted to the AWS warning horn. But neither system was switched on. How could it happen that an inter-city train was speeding through the London suburbs at 200 km/h with no train protection of any kind?

The AWS was not working because it had a fault that was reported but not corrected the night before due to inadequate test equipment at the depot. HSTs have a cab at each end, so it could be driven safely to Swansea. Here, the driver tried to get the London-end AWS repaired, or arrange for the train to be turned on a nearby reversing triangle. Nobody would take responsibility for this, so he set off back to London.

Another driver took the train over at Cardiff. The ATP was functional and would have rendered the AWS failure irrelevant once the train reached the ATP-equipped line beyond Bristol Parkway. But the new driver did not switch it on because he was not required by the rules to do so, and also considered himself to be inadequately trained in its use.

The GWML ATP was one of two pilot installations approved by the BR Board in November 1988. It had suffered a long history of technical problems and delays both before and after privatization. As a result, the train operator was extremely reluctant to move from the test phase to in service, because this would have meant taking trains out of service if the ATP failed, which it did all too frequently. Today, long after the use of ATP on GWML trains became mandatory, ATP failure is still the most common reason for taking HSTs out of service.

Great Western Trains (GWT), the franchised operator, received a (then) record fine of £1.5 million (£1=$1.57) for its failure to resolve these problems. There is no doubt the development of the pilot ATP was significantly hampered by separating responsibility for the infrastructure (Railtrack), train operation and light maintenance (GWT), and HST rolling-stock ownership (Angel Trains). The failure of the GWT control centre at Swindon to deal properly with the driver's request for help and advice over the AWS fault was deplorable.

I conclude that privatization and fragmentation played a significant role in this accident, but having said that, there was at that time no explicit requirement

under the rules that a train with AWS out of service must not complete its journey. There is now.

At Ladbroke Grove, the DMU operated by Thames Trains, another franchised operator, had working AWS but was not fitted with ATP. The fleet of Thames Trains operating the Paddington commuter service was not included in the original ATP pilot trial.

The blame for Ladbroke Grove must lie primarily with a new track layout installed around 1993. For the first 3 km out of Paddington, there were six parallel tracks of more or less equal status, all signalled for both directions. The function of the junction at Ladbroke Grove was to reduce the six track SL to a more traditional arrangement of four lines: down main, up main, down relief and up relief.

The six-track section is in a deep cutting below urban streets that cross on several large bridges. At night, and especially where the line curves, there is nothing to tell the driver which of the six signals on a gantry applies to his track. So he must first remember which track he is on, and then count across from one side or the other the signal lights he can see. But this doesn't always work because individual signals are obscured at irregular intervals by the bridges or the overhead wires. The DMU driver was heading out of Paddington on Track 3 in the middle of the layout.

Moreover, AWS was of no help to the driver. It sounds a warning at every red or yellow signal, and must be acknowledged to prevent automatic application of the brakes. However, the driver saw several yellow signals, where he rightly cancelled the warning.

But this was broad daylight. It was just after 08:00 in October with a bright sun rising directly behind the DMU train, and shining straight into the signals. A photograph taken exactly 24 hours later with a cloudless sky, shows signal SN109, which was mistakenly passed at red, with two of the four lenses quite distinctly showing a dull yellow; the red lens is lit and the green lens shows black.

Ladbroke Grove: The dark patch of ground in front of the DMU shows where wreckage of the destroyed leading car burned after its fuel tank burst. This was the highest collision speed ever recorded for a head-on collision. (B. Morrison)

The DMU driver was very inexperienced. He had no railway knowledge when he joined Thames Trains in February 1999 and he was passed out as a driver on 22 September, less than 2 weeks before the October collision. The facts suggest that he thought he saw signal SN109 with two dim yellows (meaning two clear blocks ahead) at a moment when the much brighter red was obscured by a bridge. He cancelled the AWS, looked away from the signal and accelerated into the collision about 1 km later.

Was privatization to blame? At least partly, and for two reasons. First, many franchisees bid on the basis that BR was inefficient and they could cut staff. There was hardly any recruitment and training of drivers—they were simply poached by one operator from another. Not surprisingly, this resulted in an acute shortage of drivers, so they were recruited off the streets and trained in a hurry. The inexperienced DMU driver obviously did not understand the layout at Ladbroke Grove properly.

Second, signal SN109 had a bad record for SPADs. There had been eight since it was commissioned in 1993, including a 'dress rehearsal' in February 1998 when a GWT HST with the ATP turned off could have collided head-on with a *Heathrow Express* EMU if the driver not seen the red signal at the last moment.

There were also far too many SPADs at other signals on the six-track stretch, including one sidelong collision. Railtrack was heavily criticized for bureaucratic inertia in failing to do something about it, although in fairness, signal SN109 was altered in 1994 to improve the sighting. However, given the circumstances, I am not convinced that BR would necessarily have performed any better than Railtrack.

The Uff/Cullen Report

With its images of blazing coaches and badly burned survivors, and the fact that SPADs were now being viewed as the

principal remaining risk on the railway, the formal inquiry into Ladbroke Grove conducted by Lord Cullen, which took oral evidence from no fewer than 182 witnesses, spawned two more inquiries. The first to report in March 2001 was conducted jointly by Lord Cullen and Professor Uff, who had chaired the formal Southall Rail Accident Inquiry Report, and it dealt exclusively with automatic train protection strategy. The second report on the structure of safety regulation we will address later.

One basic reason why ATP had not got anywhere in the UK up to that time was a report produced by BR in July 1994 that showed it was not cost effective in safety terms. ATP also reduces line capacity, unless the train is updated continuously about the aspect of the next ahead signal, which would cost even more money.

Put in round figures, safety expenditure on the roads was theoretically considered at that time to be justified below £700,000 per life saved, although few schemes exceeding £100,000 per life saved were approved in practice. BR had enjoyed some limited success in convincing HMRI that £2 million was an appropriate threshold for rail when assessing safety investment projects. ATP came in at around £14 million, and was therefore rejected.

But something had to done about the glaring deficiencies of AWS, which required drivers heading down the main line out of Waterloo in the evening peak to drive continuously at full speed on double-yellow signals, cancelling the AWS horn by reflex action at every one. The compromise was the Train Protection & Warning System (TPWS), a unique British train protection system that will at least stop trains approaching a red signal at less than about 115 km/h within the safety overlap. It also applies the brakes immediately when a red signal is passed at any speed. Subsequent regulations made it a legal requirement that all trains and signals protecting conflicting movements are fitted with TPWS by 1 January 2004, and the work is on-going. The fact that 'specification creep' has pushed the cost per life saved from the original £3 million up to £14 million is just one of those things.

Uff and Cullen reluctantly accepted that TPWS, with some further enhancements, must go ahead, but wanted it supplemented as quickly as possible by full ATP in the form of the European Train Control System (ETCS), which is the signalling component of the European Rail Traffic Management System (ERTMS). In demanding that ETCS be in place by 2008 on all lines where trains exceed 160 km/h, they threw cost/benefit analysis out of the window on the twin grounds that it would soon be 'mandated by law', and 'provision has been made for public funding.'

Neither assumption was valid at that time, and it has since become obvious that ETCS at the required level (Level 2) for efficient operation is not going to be fully developed before 2008. It is also because ETCS is proving hugely expensive. Given that TPWS is now expected to deliver 81% of the safety benefits promised by full ATP, the sensible policy is to press on with ETCS development and see what safety benefits TPWS actually does deliver over the next 5 years.

The Hatfield Disaster

As rail accidents go, the Hatfield derailment was not remarkable. Most coaches remained coupled, and had the buffet car not hit the electrification support, there would have been little more than walking-wounded casualties. But the impact of Hatfied on Britain's railways was colossal. Railwaymen still talk of 'pre-Hatfield' and 'post-Hatfield' in the way my generation used the terms 'prewar' and 'postwar' 50 years ago.

The cause was immediately obvious. Within 2 hours, TV pictures quickly revealed not only that the outer rail on a curve with a 1400-m radius ended at a clean transverse fracture, but also that most of the rail head was dark with rust from a crack that had started at the gauge corner many months earlier. This did not stop the police closing the site for several hours while the track and train were searched for terrorist bombs!

Closer inspection of the running surface of the rail showed it was riddled with cracks to the point where flakes had spalled out, leaving pits that somebody had made a futile attempt to grind out a few weeks earlier. Indeed, there were so many cracks that the first 35 m of the rail beyond the derailment point had shattered into pieces, none of which was more than 1-m long.

Hatfield sparked a worldwide debate among railway engineers on rolling contact fatigue cracks and the way they propagate. It is still possible that companies and individuals will face prosecution in the same way that three German engineers are on trial for manslaughter over the break-up of a resilient wheel on a German ICE at Eschede on 3 June 1998 that caused 102 fatalities. Suffice it to say that in January, the rail was identified as being in urgent need of replacement. The work was scheduled but not carried out, and no temporary speed restriction was imposed. The curve was permanently limited to 185 km/h.

While the role played by the fragmented structure imposed on Britain's privatized railways in the Southall and Ladbroke Grove accidents continues to be a matter of debate, there can be no possible doubt that it was entirely responsible for Hatfield. We can be equally certain that the ministers and their advisers who created the structure will never face trial, let alone a prison sentence.

Three organizations were involved in keeping the ECML through Hatfield in

good condition. One company held the contract for maintaining the track, but another was contracted to replace rail and other track elements when instructed. Railtrack was supposed to manage both contracts. The normal procedure was for the maintenance contractor to notify Railtrack if it believed a rail was defective, and if Railtrack agreed, it would instruct the other firm to replace it. Exactly what communications passed between the parties has yet to be revealed.

But Railtrack held no comprehensive record of track condition. Such records as existed in BR days were sold with the maintenance companies to the highest bidder along with the skilled staff and equipment used to inspect the rails. The contractors were left to monitor their own work and arrange track possessions for engineering works, which Railtrack could veto if the train operators objected.

In a situation that called for cool heads and experience, Railtrack's directors (who knew almost nothing about railways themselves) found after the accident that hardly anybody else at senior levels in the company did either. For example, the Chief Operating Officer whose job it was to keep the trains running had been recruited from the water industry a few weeks earlier.

The result was abject panic. Contractors were sent out to check rail for cracks, and the WCML to Scotland was closed for 3 days (at 2 hours notice) stranding trains in mid-journey while they did so. Nothing as bad as at Hatfield was found, but cracks were reported at hundreds of locations. Eventually, the total was to exceed 1200.

Because Railtrack's senior management had no background knowledge to guide them in assessing the risk of another derailment or the consequences of the action they decided to take, hundreds of speed restrictions were imposed, some extending for several kilometers at 32 km/h.

The timetable collapsed instantly, especially on intercity routes where most cracks were found. Subsequent revenue losses have certainly exceeded $1 billion. Traffic volumes in terms of passenger-km, which had been growing at a consistent 6.5% for the previous 3 years, are now stuck at pre-Hatfield levels. Railtrack was put into administration by the government on 7 November 2001, and replaced on 3 October 2002 by Network Rail.

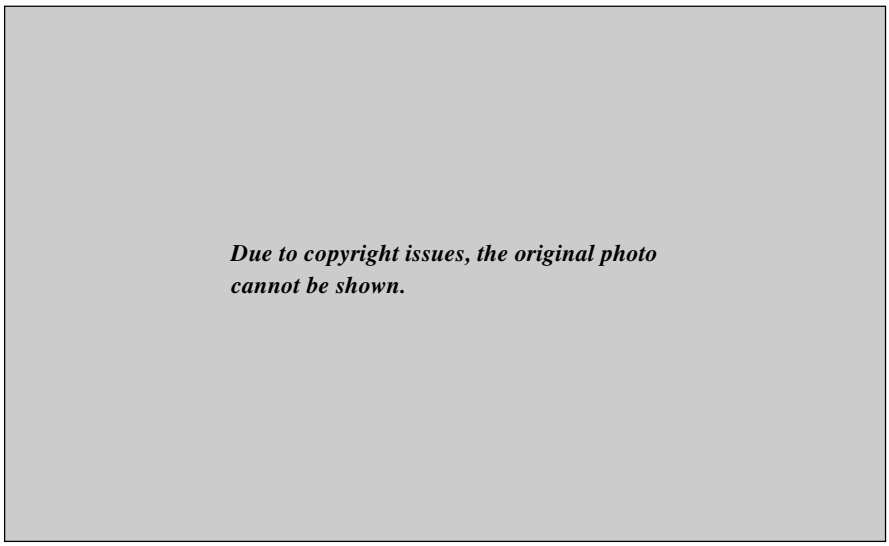
The Potters Bar Mystery

As already noted, the Great Heck derailment was caused by a road vehicle finding its way on to the ECML by a route that few people would have thought possible. The issue of rail privatization played no part in the accident.

The last in our series of five high-speed accidents at Potters Bar last May remains a complete mystery that the police are still investigating. Both HSE and the police claim to have found no evidence of sabotage, but photographs taken immediately after the accident show that the inside nuts on one of the stretcher bars had been turned so as to force the two switch rails apart by at least 30 mm. The effect was to reduce the gap between the switch rail and the stock rail through which the wheel flanges of every train must pass from about 50 mm to perhaps 20 mm, putting severe stress on the locking stretcher.

Later tests demonstrated that it would have taken one man with a spanner more than 20 minutes to remove the outside nuts from the stretcher bars, release other nuts so than the points would still function and be detected by the signalling as correctly set, and then distort the switch rails in the manner described. The points had been worked on by a maintenance crew 10 days before the accident and were inspected 9 days later. Bright metal on the exposed threads suggested that the distortion of the points might have occurred only hours before they broke.

That the points were distorted seems clear, even though HSE will neither confirm nor deny the fact. Was it sabotage or a tragic blunder by some inexperienced worker? No group has claimed responsibility and there has been



Hatfield: New rail is waiting to be laid in the third track from the camera, but the work was delayed. The six fatalities were in the buffet car, seen on its side with the roof sliced open by an electrification support. (Reuter=Kyodo)

no arrest. If it was deliberate, what was the motive? The work was done carefully to avoid losing detection of the points and thus putting the signals to red automatically, so it could hardly have been be mindless vandalism. And how did the saboteur (if there was one) know that the locking stretcher would fail from fatigue due to stress reversals?

As yet there are no answers to these questions. Until there are, we cannot say whether or not the maintenance contractor was at fault, let alone whether privatization was in any way to blame for the failure of the points.

A New Safety Structure

Much has changed in the year since Railtrack was put into administration. For example, there is now a much stronger focus on the need to recruit and train civil and signal engineers. The Strategic Rail Authority under its new Chairman, Richard Bowker, is using the financial muscle gained by the failure of some 40% of the passenger franchises (partly because of Hatfield) to force through new policies such as rationalizing train speeds on routes to increase capacity. Network Rail is still an unknown quantity.

One major worry is the massive increase in project costs. Eighteen months ago, these were running at around 2.5 to 3 times higher than what BR had been spending, after allowing for inflation. Now it is something like five times more. One reason is compensation to train operators for track possessions for engineering works, which have increased massively because too many track workers were being hit by trains.

A set of 100 km/h crossovers between the fast and slow tracks is being installed this autumn at Ledburn, 60 km north of London on the WCML, Railtrack's busiest intercity route. The cost is close to $160 million, of which perhaps 50% is compensation to train operators because all four tracks are being closed over a distance of 40 km for a total of some 900 hours to do the work with resignalling. This represents lost revenue plus the cost of bussing those passengers who continue to travel around the 40 km blockade.

This is just one way in which attempts to make the fragmented railway safer, if not more efficient, are driving up costs. The government has rejected the idea of a new rail structure but it is going to change the way safety is regulated.

I mentioned that Lord Cullen produced a third report on Ladbroke Grove. This deals with ways in which rail safety management can be improved and proposes setting up two new bodies to regulate safety.

Back in 1999, HSE and HMRI investigated accidents, approved new works including rolling stock, and had overall responsibility for safety cases. Railtrack, through its Safety & Standards Directorate (S&SD), produced the Group Standards that cover everything from brake performance to the sighting distances for signals.

Lord Cullen's proposal to set up two new bodies is expected to happen as soon as legislation can be enacted. First, there will be an organization matching those that already exist for air and sea transport, specifically charged with investigating rail accidents. Hopefully, like the Air Accident Investigation Branch, it will be staffed by people who have actually worked on railways. Unfortunately, the trend since HMRI was transferred to the HSE in 1991 has been to appoint experts in safety systems and procedures.

Railtrack's S&SD, now known as Railway Safety, already enjoys a high degree of independence from its new parent Network Rail. In effect, Lord Cullen proposes that Railway Safety achieves complete independence and becomes the industry's standards body. It would also be responsible for accrediting suppliers, and would monitor the implementation of recommendations in accident reports.

This change would leave HSE and HMRI with two principal rail functions. They would become fully responsible for approving and monitoring all safety cases—a task originally delegated to Railtrack in the case of train operators—and would continue to approve new works. Lord Cullen effectively backed HSE's recruitment policy for HMRI, which is currently doubling its staff, by recommending that instead of the traditional Chief Inspector of Railways it should be led by 'a person of outstanding managerial ability, not necessarily with a railway background.' ■

Richard Hope

Mr Hope is a chartered electrical and mechanical engineer who joined British Rail in 1959 to work on the electrification of commuter lines east of London. After a working visit to Australia, during which he was involved in upgrading the line from Townsville to Mount Isa, he joined the staff of *Railway Gazette* in 1964, becoming Editor in 1970. Since retiring in 1991, he has continued to write as Consultant Editor for *Railway Gazette International* and also for its UK newsletter, *Rail Business Intelligence*.