

MOORGATE: "IF THERE'S A HELL, I'VE LIVED TO SEE IT."

by Peter J Davis

Introduction

At 8:46am on Friday 28 February 1975 a London Transport Northern Line (Highbury Branch) train – number 272 – carrying around 300 passengers ploughed through a sand-drag inside a 66'9"-long terminal tunnel at the end of Platform 9 at Moorgate Underground station. It demolished a substantial buffer installation and crashed into a solid 5'-thick concrete wall.

The lights inside the six-coach train and on the platform immediately went out. The recommended speed on approaching the station was 15 miles per hour (mph) and driver Leslie Newson – known amongst his colleagues to be naturally cautious in his driving habits – had the usual practice of slowing down early when approaching a station and letting the train coast into position at the platform. However, on this occasion the train was travelling at an estimated 35 mph and appeared to be accelerating. When the first rescuers reached the platform it appeared to them that a four-car train had entered the tunnel and that the leading coach (later to be established as the third coach) had simply run into the disused single hydraulic buffer located some short distance within the tunnel itself. However, it soon became apparent that the first two and half coaches had crumpled to half their length within the short dead-end overrun tunnel (see Figs. 1 and 2).

On Friday 28 February 1975, the world-famous London Underground suffered an horrendous disaster when a Tube train failed to stop at the end of the line and smashed into a dead-end tunnel at Moorgate. Forty-three people died as a result of the incident and a further 72 passengers received injuries requiring hospital treatment.

Over the next six days, a huge multi-agency rescue and recovery operation took place in extremely demanding circumstances. Confined spaces, decaying bodies, a lack of ventilation, dangerous working conditions, high temperatures and foul air all contributed to an operating environment which led one doctor working at the scene to comment: "If there's a hell, I've lived to see it."

It is now over 45 years since the disaster and many theories for the cause of the crash have been suggested. It is highly likely that with the passage of time, the definitive answer will never be known and it will simply remain one of life's mysteries. However, the disaster remains a classic case study of major incident response and here the author reflects on several weeks of fascinating research – including trawling the archives and speaking directly to several people who responded to the scene – to present an overview of the incident, some of the suggested causes and the important lessons to be learned.

The Tube driver's cabin – normally about three feet from front to rear – was crushed to a depth of between six and 12 inches against the concrete end wall at ceiling height. The first coach was bent into a shape like a large hockey stick with its first section (approximately 17' long) dipping downwards from the roof to the tunnel floor and the remaining two sections forming the handle of the hockey stick as they climbed back to the ceiling of the tunnel. Lethally, the coach jack-knifed at the bend of the 'hockey stick'. The first section of the second coach was rammed directly beneath the

sloping rear two sections of the first coach and the rear bogey and chassis of the first coach bulldozed through the front section of the second coach, from floor to ceiling level, with devastating results. The roof of the front section of the second coach was skimmed back over the rear end of the first coach and effectively blocked the tunnel from track to ceiling level.

The front of the third coach mounted the rear of the second coach and was rammed hard against the ceiling of the tunnel approximately 15' inside

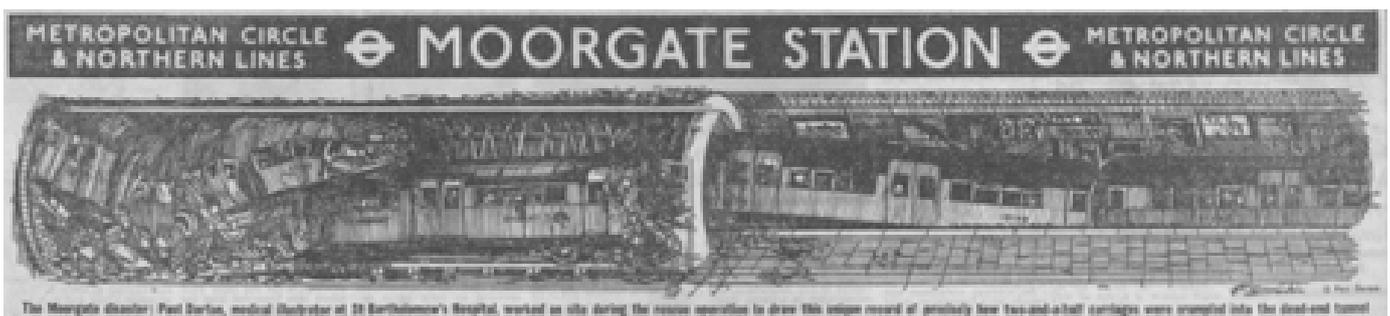


Fig. 1: The Moorgate disaster: Paul Darton, medical illustrator at St Bartholomew's Hospital, worked on the site during the rescue operation to draw this unique record of precisely how two-and-a-half carriages were crumpled into the dead-end tunnel.

the opening. This resulted in the part of the third coach still accessible from the platform being at an angle of 15-20° from the horizontal (see Fig. 3). One hundred and eighteen feet of train had become compressed into just over 66' of tunnel.

Forty-three people lost their lives as a result of the incident and 82 passengers received injuries of varying severity including chest,



Fig. 2: Artist's impression of the surface and underground operations at Moorgate.



Fig. 3: This image from Platform 9 shows the 15-20° upward incline of the third coach which partially came to rest within the 66' dead-end tunnel. Image © Alamy, reproduced under license (ref: OY31312461)

head and facial, abdominal, musculoskeletal and soft-tissue injuries. Reports indicate that the initial management of the casualties was aided by two factors: firstly, enough staff were available at each of the three hospitals which received casualties from the incident (St. Bartholomew's, The London and Guy's); and secondly, the casualties arrived at a rate that did not overwhelm the available resources.

The London Ambulance Service (LAS) reported its casualty evacuation on the day of the disaster as per Table 1 below:

The six-day rescue operation involved 1324 firefighters, 240 police officers, 80 ambulance staff, 16 doctors and numerous

Table 1: LAS casualty evacuation from the Moorgate disaster on Friday 28 February 1975

Time interval	Casualties conveyed to hospital	Dead
9:00am – 10:00am	32	-
10:00am – 11:00am	6	1
11:00am – 12:00 noon	24	2
12:00 noon – 10:05pm*	13	14
Total:	75	17 (with 24 further dead being recovered over the next five days and two later dying in hospital)

* After the removal of the last casualty at 10:05pm (Jeff Benton, who was released at 9:57pm and then taken to the surface before removal to hospital) no further live casualties were found.

voluntary workers and helpers. The last body to be recovered at 8:03pm on Tuesday 4 March 1975 was that of the driver – or 'motorman' – Leslie Newson, a 56-year old husband and father of two children.

Potential causes and contributory factors

Mystery has surrounded the cause of the accident and to this day no-one has been able to provide a conclusive explanation as to why it happened. However unpalatable it may be, the reality is that – over 40 years later – the actual cause will probably never be definitively established.

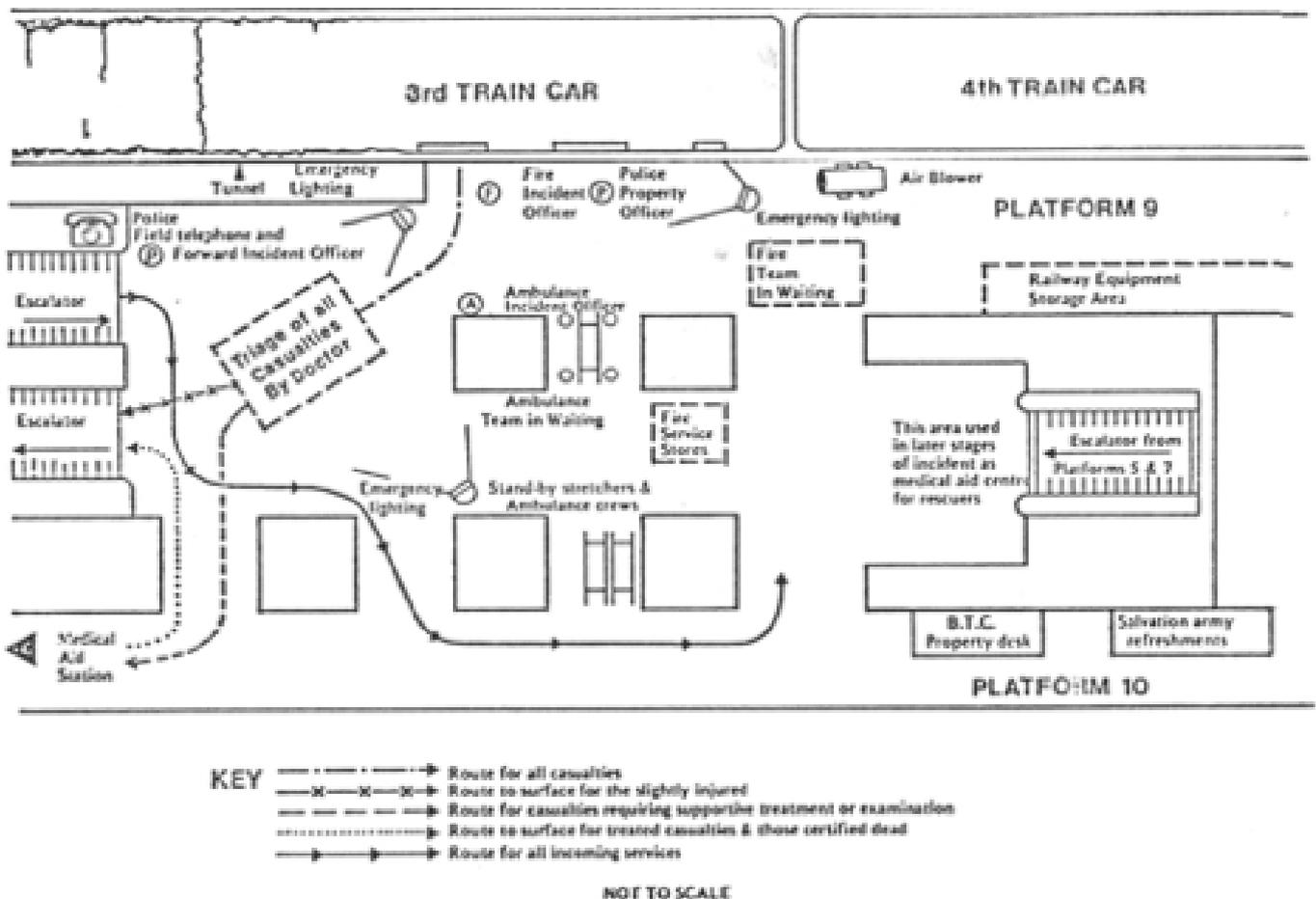
Brake (or other mechanical) failure

The official Department of the Environment inquiry into the accident revealed that the train was old, dating from 1938, but that it – and the braking system – were all in good working order. Lt Col Ian McNaughton concluded that "... there was no fault or condition of the train involved in this accident which would have prevented Motorman Newson making a normal, controlled approach to Moorgate and stopping correctly in the platform." Having ruled out mechanical failure, he went on to conclude that "the accident was solely due to a lapse on the part of the driver" and that "Newson was conscious up to

the moment of collision and that he made no effort of any kind to stop the train."

Interviewed for an episode of the television documentary Disaster Terry Lowe, a London Transport investigator who worked on establishing the cause of the incident in the weeks which followed, confirmed that they could find no rational explanation for the crash. In particular, he detailed three critical conclusions in respect of the rolling stock:

- firstly, that the investigators could find nothing wrong with any of the braking equipment which adversely affected the train's performance;



15 Plan Moorgate Station.



Fig. 4 (top and above left): The intervention organisation established at platform level during the rescue of live casualties; and (above right) at 5:00am on Sunday 2 March 1975, the Site Medical Officer – acting on the advice of the City of London's Public Health Department – required all rescue staff working in the wreckage to have an anti-tetanus injection to be administered by a doctor.

- secondly, that the control equipment in the driver's cab was in perfect working order; and
- thirdly – and probably most importantly – that there had been no attempt whatsoever to apply the brakes and, in the investigators' view, the train was still motoring and under power at the moment of impact.

Possible medical impairments or conditions

The post mortem examination of Leslie Newson found the cause of death to be shock from multiple injuries and Prof Keith Simpson (Professor Emeritus at the University of London and Head of the Department of Forensic Medicine at Guy's Hospital) reported that the deceased appeared to have been a perfectly healthy man. In particular, he found no brain disease and nothing to suggest that a seizure of any kind had been likely or had taken place; there was no coronary thrombosis or other abnormality of the heart; the lungs were healthy; there was no undissolved drug or poison matter in the stomach and no smell of alcoholic drink, and the liver showed no indication of heavy drinking habits. Prof

Simpson also confirmed that he had made a particular examination of the possibility of electrical injury, but that he had found no mark of electrical burn or electrical pattern anywhere on the body, nor was there any sign of electrical injury to the clothing. In trying to establish a possible cause Dr Phillip A B Raffle, Chief Medical Officer of London Transport, suggested two little-known conditions which could, in his view, explain Leslie Newson's actions – but admitted that there was no evidence to support them. The first, akinetic mutism, is almost like an electrical storm inside the brain and causes a person to freeze in such a way that their muscle tone would not be affected, thus leaving them sitting up and, in the case of the Moorgate disaster, depressing the deadman's handle. Such a condition could only be diagnosed by microscopic examination of the brain and that was not possible owing to its condition.

The second possibility was transient global amnesia, a condition in which the blood supply to the temporal lobe (at the front of the brain and controlling memory) is cut off but, in the case of Moorgate, would not have otherwise affected Newson's physical ability to drive a train. This condition would leave

no trace whatsoever at post mortem but, since it would not have prevented normal muscular movement, Dr Raffle said that he would have expected Newson to have raised his hands in a last moment attempt to protect his face. In his view, the absence of such a gesture was one of the most inexplicable things of the whole incident.

In more recent commentary Dr Peter Fenwick, a neuropsychiatrist and neurophysiologist from Kings College, London suggested that – in his view – the most likely explanation for the driver's behaviour that morning was a temporal lobe seizure, a condition in which an epileptic fit passes through the temporal lobe of the brain. In that condition, the affected person would again retain their body posture and become quite out of touch with their surroundings, which would explain the testimony of eye-witnesses who observed Newson in his cab as he drove the train at speed through Platform 9 just before the impact. Anthony Board, a member of the public standing on Platform 9 at the time of the disaster, said in his statement to the British Transport Police that:

"... my attention was drawn to the driver. The first thing I observed he was sitting

upright and he was wearing a cap, uniform style. I observed his hands were visible and in the operating position and it appeared that his right hand was on the dead man handle. The driver was completely motionless and he was in no way struggling with any controls. He appeared to me to be totally transfixed or petrified, but I have never before seen any person in such a situation and immediately thought he had been paralysed by an electric shock. A thing that particularly struck was the driver's staring eyes, they appeared to be larger than life. His eyes were completely still and looking straight ahead and gave me the impression of a determined look."

Richard M Jones suggests another possible explanation in his book published in 2015. On 21 June 1974, Les Newson was assaulted by a passenger who hit him several times around the head causing cuts and bruises to the right side of his face. He was later checked out at hospital and given the all clear but, because he hadn't lost consciousness, it was apparently decided that there was no real cause for concern. Advances in medical knowledge since the 1970s and further research into epilepsy suggest that more damage was perhaps done to Newson's brain than was appreciated at the time. The Epilepsy Society provides details of a type of fit known as a dissociative seizure for which the cause can be hard to find (but includes previous traumatic events) and for some a delayed onset may mean that episodes do not start until years after the causal event. Could this be the cause of the driver's apparent incapacity?

Whatever the answer, if a neurological condition was indeed the cause of the Moorgate disaster then it would had to have been something which had a very rapid and debilitating onset in the 60 seconds or so between the apparently

normal departure from the preceding station at Old Street and the arrival of train 272 at Moorgate at 8:46am (see Fig. 5).

Much was made in both the Coroner's inquests and the official government inquiry of the elevated blood alcohol levels found in Newson's body. After being trapped in the motorman's cab since the moment of impact on Friday 28 February until being brought to the surface at 8:03pm on Tuesday 4 March 1975, subsequent toxicology reports revealed that Newson had alcohol concentrations ranging from 4.4 to 17.4 mmol/l (20 to 80mg/100ml) in four separate blood samples, reflecting the erratic nature of the phenomenon of post mortem blood alcohol production.

At the inquest into Leslie Newson's death held by Dr David Paul, HM Coroner for the City of London, Dr Anne Robinson (Senior Lecturer in Forensic Medicine at the London Hospital Medical College) gave detailed evidence of her examination of the samples taken from Newson's body by Prof James Cameron (who assisted Prof Simpson at the autopsy). As a check, she also undertook tests on specimens taken from eight of the passengers killed in the accident whose bodies had been exposed to similar

conditions for similar lengths of time to that of the driver. In her view, the bacterial and yeast content of the specimens was not, in any of the cases examined, such that it would have caused any significant formation of alcohol by fermentation (or otherwise). As a result, Robinson reached her highly contentious conclusion that Newson had drunk alcohol on the morning of this death.

An alternative view of the significance of the alcohol levels found by Dr Robinson – in particular as to whether the alcohol was present at the time of death or formed subsequently – was taken by Dr Roy Goulding, Director of the Poisons Unit at Guy's Hospital. Though he accepted the numerical results of Dr Robinson's analyses he concluded that, on the information available, he could not come to the inescapable conclusion that alcohol had been present in Motorman Newson's body prior to death. Equally, he could not unequivocally state that no alcohol at all had been consumed before death but, if any had been consumed, then it must have been a very small amount. More recently, Pounder suggested that although the technical aspects of measuring ethanol in body fluids are much the same in the living and the dead, the interpretation of results obtained from autopsy samples



Fig. 5: At the time of the Moorgate Tube disaster, Platforms 9 and 10 formed the southern terminal of the Highbury Branch line. By the time the official inquiry report was published on 4 March 1976, London Transport services had been withdrawn from the Highbury Branch which had been handed over to the Eastern Region of British Railways to form the City terminal to the Great Northern suburban electric services.

is confounded by several problems. Distinguishing between alcohol ingestion in life and microbial production after death is a common problem and one which was to prove crucial to the Moorgate investigation. Within a few hours of death, gut bacteria penetrate the portal venous system and, after about six hours, contaminate the systemic vessels. In the blood, glucose and lactate provide the substrates for microbial ethanol production by a pathway opposite to that of its catabolism in the living body. High environmental temperatures after death (which, in the case of Moorgate, reached in excess of 120°F within the first hour of operations on the first day and continued to provide a significant challenge during the entire rescue and recovery operation), abdominal trauma and severe trauma with wound contamination all provide particularly fertile conditions for ethanol synthesis and disruption of the body of a severity similar to that seen in the case of Motorman Newson carries a high risk of post mortem alcohol production.

Daydreaming?

Other London Underground train drivers have suggested that Newson could have simply been daydreaming and either forgot where he was on the line or somehow forgot to apply the brakes. Apparently, such possibilities are not as far-fetched as they might seem to the layman. One Tube driver commenting on an online thread regarding the Moorgate disaster wrote:

"Most likely, he ran out of railway. It nearly happened to me twice. I got halfway into the platform before realising I had forgotten to start braking. On the first occasion, I was at Preston Road on the down slow and realised I was never going to stop. It was dark and wet and I knew I'd never be able to stop in the platform. I just carried on. My guard yelled down the phone at me: "Are you going to stop at Northwick Park?" "Oh

well yeah, okay – might as well," I replied as nonchalantly as possible, knowing he was getting a whole load of flak from the punters, since the exit at Preston Road is at the rear of the train and it was 17:30.

*"As soon as I heard about Moorgate I thought: "Poor b*****d ran out of railway. He forgot to stop and thought he could carry on to the next station!"*

On the other hand, if Newson had simply been daydreaming then it would be reasonable to assume that the jolting of the train running at speed over the crossover just before entry into Platform 9 (along with the approaching station lights, see Fig. 6) would have roused him from his trance. Equally, even if there was a combination of forgetting where he was on the line, overrunning the platform by mistake and simply thinking he had no option but to continue on to the next

Suicide?

Several points were highlighted at the inquest to suggest that suicide was not a likely cause. The previous day Newson had asked his wife to withdraw some money with which he planned to buy his daughter a car – not, it was argued, the actions of someone intent on suicide. Other indicators included future plans for a holiday in America, the planned purchase of a new camera and, as noted in Lt Col McNaughton's official report, the fact that none of his colleagues had noticed anything out of the ordinary in Newson's behaviour that morning. Indeed, Motorman C. A. Gladding had recalled asking Newson for some sugar for his tea that morning to which Leslie replied: "Go easy with it, I shall want another cup when I come off duty." Others queried why someone so seemingly conscientious and clearly proud of being a London Tube driver would want to die in such a way that others would



Fig. 6: View into Platform 9 at Moorgate from the southbound running tunnel which clearly shows the crossover which would have been traversed at about 35mph. Entry to Platform 10 is via the left hand tunnel.

station (which, of course, didn't exist) then it would be reasonable to assume that running into the sand-drag and then hitting the hydraulic buffer would have caused at least some reaction, however small – including, perhaps, the release of the deadman's handle and some instinctive reaction to protect himself against the imminent impact.

subsequently form an immortal impression that he was quite the opposite, and that in general he simply had "too much to live for" including the recent birth of his grandson. Conversely, some argued that Newson's deafness and reported impotence masked a deeper depressive illness. In the inquest into the Moorgate deaths, Guard Robert

Harris stated that Newson had ominously overshot at another station the week before the disaster with American suicide expert Dr Bruce Danto later suggesting: "That doesn't sound like misjudgement to me. That sounds like a man who's getting used to the feeling of how to run a train into a wall." Quite how that extrapolated conclusion is reached is far from clear.

In a television interview for the Discovery Channel's Disaster series, Richard Hope of the Railway Gazette noted: "This would not have been just an 'ordinary' suicide – it would've been an act of revenge against society at large. It could only have been undertaken by somebody who was nursing some terrible secret grudge and wanted to take as many other people to their deaths with him at the same time as he committed suicide. That, of course, is a very unusual state of mind indeed and there was no evidence of that at all." Psychologist Dr Richard Fox has also commented that "... suicides rarely, if ever, take others with them" although of course the more recent example of Germanwings co-pilot Andreas Lubitz (who deliberately

crashed his Airbus A320 in the Alps in March 2015 killing himself and 149 other people) demonstrates that these events can – and do – occur, however infrequently. The verdict returned by the inquest was 'accidental death', both in respect of Motorman Newson and all 42 passengers who lost their lives. However, in his television documentary *Me, My Dad and Moorgate* Laurence Marks recalls a discussion he had with HM Coroner for the City of London during the course of his research for an investigative feature he was writing for The Sunday Times in which Dr Paul is said to have commented: "Between you and me, I don't think it was accidental death. It is my belief, Laurence, that it was suicide – but I can't direct a jury towards suicide unless there is a note. But I would move along those lines in your investigation if I were you."

Delayed memorialisation

Interestingly, there was no memorial to the victims of the Moorgate disaster until the first of two plaques was unveiled in Finsbury Square on 28 July 2013. It was the result of a campaign spearheaded by Richard M Jones,

author of *End of the Line: The Moorgate Disaster*, who raised money for the memorial and secured the space on which it stands just a few hundred yards from Moorgate Underground station and a few feet from the City of London border (see Fig. 7, left).

Just a few months later, London Underground also announced plans to erect their own memorial at the station itself which was unveiled on 28 February 2014 (see Fig. 7, right). For many years, London Underground had refused to erect such a memorial, arguing that "If we put one up for Moorgate then we would have to put one up for everybody who had died on the Underground." Of course, several memorials already exist for other tragic events including the King's Cross fire in 1987, the terrorist atrocities on 7 July 2005 and several other wartime tragedies including Bethnal Green and Balham. Jones suggests that the company's change of mind was ultimately down to Tony Hall, one of London Underground's own employees, whose own sister Theresa was herself one of the victims of the disaster.



Fig. 7: (left) The memorial dedicated to the memory of the 43 people killed in the Moorgate disaster; and (right) the memorial plaque installed by London Underground outside Moorgate station.

Lessons learned

In his report produced on behalf of the City of London Police, Chief Inspector Brian Fisher noted that "... in spite of extensive pre-planning for major incident intervention, the situation at Moorgate

posed an unforeseen event for the force. However, plans had deliberately been kept simple and capable of adaptation by the police officer-in-charge to suit any situation with which they are faced. This incident showed the value of such simple plans."

Fisher went on to draw out the following lessons from the multi-agency response to Moorgate:

Table 2: Lessons learnt by the police as a result of the Moorgate disaster (Fisher, 1975)

Lessons Learned	Remarks
1.	In spite of extensive pre-planning for major incident intervention, the situation posed by this incident had not been foreseen. Plans had, however, deliberately been kept simple and capable of adaptation by the police officer in charge to suit any situation with which [they] were faced. This incident clearly showed the value of such simple plans.
2.	If control and co-ordination at an incident are to be established effectively, all necessary control systems must be despatched to the scene immediately so that they become available to the Police Incident Officer from the earliest possible time.
3.	Ideally, each service should appoint a quartermaster for ensuring adequate supplies of back-up equipment. The police are probably the best service to act as quartermaster for supplies required by any service which they cannot obtain from their own resources, thus avoiding any duplication of effort. To effectively perform this task police plans must include a continually updated list of agencies capable of providing specialist services or equipment.
4.	Police plans should include a scheme for the reallocation of duties at the time of a major incident. Planning should allow for non-essential police tasks to be curtailed and for pre-trained staff to be allocated to pre-determined specialist duties in connection with a major incident situation.

	Lessons Learned	Remarks
5.	The rapid co-ordination of various intervention services and organisations can be greatly enhanced by the meeting of senior officers of those services / organisations during the pre-planning process, thereby enabling a direct personal approach to co-ordination being achieved at the incident.	The importance of personal connections and 'making your friends before you need them' have long been recognised by anyone involved in major incident planning and response. The value of trusted relationships forged as part of 'business as usual' ahead of any incident was exemplified by a comment made by Dr Ken Hines to the author in the preparation of this article. Referring to C/Insp. Brian ('Bud') Fisher from the City of London Police, Dr Hines said: <i>"Of course I knew Bud Fisher already – he used to attend some of our (North East London Accident) unit meetings so when I arrived at Moorgate we could greet each other by our first names. The trust was already there."</i>
6.	The immediate availability of field telephone communication facilities and pre-planned emergency Post Office communication arrangements will ensure a positive line of communication from an early time following an incident.	Moorgate not only presented challenges in terms of technical communications (solved in part by the use of the experimental 'Figaro' radio communications on trial with the London Fire Brigade at the time) but also provided some interesting lessons in verbal communication. The incident produced a well-known example where the instructions given over the radio from the scene of operations within the tunnel back to medical services at street level apparently converted the word "Entonox" to "empty box" but whether this actually happened or is simply an enduring urban myth is open to some debate.,
7.	Intervention planning must accept and allow for the natural human reactions of police officers. Police officers first on the scene will become involved in rescue of casualties. Plans must therefore provide for the subsequent withdrawal from such automatic activity as soon as the accepted rescue services are present in sufficient numbers.	The first duty of all the emergency services is the saving of life. Individuals' basic human instincts, societal expectations and organisational requirements will all combine to see first responders undertaking whatever tasks are necessary to preserve life and relieve suffering. Plans must clearly account for basic realities and not assume that members of responding agencies will limit their activities solely to their responsibilities as laid down in formal written plans. The nature of emergency responders is such that if something needs doing, they will tend to get on and do it themselves if there's no-one more suitable or better qualified on hand to undertake the task.
8.	All information regarding the incident, casualties, etc. should ideally be channelled through one outlet, thus ensuring a comprehensive and accurate release of information at all times.	The vital importance of effective liaison between the ambulance service, hospitals and the Casualty Bureau has been demonstrated time and time again, particularly in establishing accurate casualty figures and nominating one agency as the 'single source of truth' with regard to the public release of those figures.

Lessons Learned	Remarks
<p>9. Regular training of police, and supporting outside organisations, not only in their major incident procedures but also the background procedures of all other services, must be carried out and exercised if an incident is to be policed and co-ordinated successfully.</p>	<p>Anyone involved in the areas of civil protection, emergency management and resilience will recognise the continuing importance of this recommendation. However, it is interesting to note one of C/Insp. Brian Fisher's concluding remarks in the City of London Police's official report into the Moorgate disaster:</p> <p>"502. <i>It is Force policy to ensure that all personnel, from the Commissioner downwards, receive training in the specialist duties and procedures that are required to be practiced at times of a major incident.</i></p> <p>"503. <i>One always hoped that the need to use such procedures never arises and thus students on courses, whilst basically acknowledging the apparent need for such training, tend to consider it rather a waste of their time.</i></p> <p>"504. <i>Over the years this outlook was slowly changing, especially following the Old Bailey incident in 1973. It has been extremely gratifying to me to receive unending comments from all ranks of the Force to the effect that '... we all thought your training was a waste of time, but now realise that it is essential to the smooth running of the operation' Perhaps the highlight of these comments was received from a Sergeant of the Force. He is known to all personnel as one who has always found fault with various aspects of the service yet, on this occasion, he saw fit to walk from his Divisional Station to Headquarters and personally express his views of the operation."</i></p>



Fig. 8 (left): The scene outside Moorgate station during the first days of the emergency response – note in particular the co-location of the emergency services' control units; and (right) C/Insp. Brian Fisher of the City of London Police wearing the 'Police Incident Officer' tabard alongside his ambulance service counterpart.

Conclusion

In a paper²⁴ presented in 1976, Chief Officer Joe Milner CBE of the London Fire Brigade commented that: "From the outset of the Moorgate operations, it was obvious that if a Staff College instructor had been assigned the production of a major accident scenario for a fire service exercise, this incident would have out-matched the demands of the most meticulous Commandant."

He was undoubtedly right. The unprecedented challenges presented by the incident severely tested the joint response of London's emergency responders working in appalling conditions deep under the streets of the capital. Their professionalism, skill, courage and determination saved many lives that day, brought comfort and reassurance to those who were trapped in the wreckage and demonstrated the best traditions of the emergency services to Londoners, to the country and to the rest of the world. **▲**

Acknowledgements

Special thanks are extended to a number of people for their encouragement and kind assistance in the preparation of this article including Dr Ken Hines, Dr Ed Walsh, Phil Trendall, Jeremy Wall and Tony Moore.

References

1. Reported in The Daily Telegraph (No. 37252) on Saturday 1 March 1975.
2. Paragraph five of the official City of London Police report into the disaster (1975) notes that: "In spite of broadcast appeals at Moorgate Station and through the broadcast media, it has not been positively established as to the total number of passengers on the train at the time of the incident." A later conference paper by Fisher (undated) suggested that the "... total number of passengers on the train at the time has been variously estimated at between 200 and 300." The opening paragraphs of Lt Col Ian McNaughton's official report into the disaster state: "The train was carrying some 300 passengers ..."
3. A mound of sand placed between the rails to slow a train should it fail to stop at the red light.
4. In the immediate aftermath of the disaster, the well-recognised photograph of Tube driver Leslie Newson appeared widely in the media. In his 2015 book *End of the Line: The Moorgate Disaster*, Richard M Jones reports that within two hours of the crash a man appeared at the Newson's home and put his foot in the door to prevent it closing, insisting he was an official who needed a photograph of Leslie for identification purposes. His wife, Helen, grabbed a passport photo of her husband and handed it over but didn't immediately realise that she had been duped by a disreputable news reporter. The photo was printed in every national newspaper the next morning. Given the reported deception involved in its original acquisition, the image has been deliberately omitted from this paper.
5. Interestingly, there was no speedometer fitted to the 1938-design rolling stock involved in the Moorgate incident and it was left to an individual driver's experience to judge the train's approach speed into a station. Evidence to Lt Col Ian McNaughton's official inquiry into the disaster provided varying estimates of the speed at which the train entered the station with Relief Signalman W. Wade providing an estimate of 35-40 mph (see para. 41), Guard B. A. Friar estimating the speed at 30-35 mph (see para. 43) and members of the public waiting on the platform estimating the speed at up to 40 mph (see paras. 48 and 49). One passenger on the train – having "... taken particular care to try and make a good estimate of the train's speed" – provided a very precise estimate of 44 mph (see para. 54).
6. Different reports provide differing figures. While the London Fire Brigade report (Milner, 1975) suggests that the driver's cabin was crushed to "about one foot" other reports indicate that "... the cab, normally 91cm (3') deep, had been crushed to 15cm (6")" (Wikipedia, accessed 3 April 2019)
7. The Sunday Times, 29 February 1976, pp 17
8. Forty-one people died in the period immediately following the incident, either within the wreckage or en route to hospital. Two people subsequently succumbed to their injuries and died later in hospital: Jeffrey Benton in The London Hospital on 26 March 1975 (from 'crush syndrome' after his prolonged entrapment alongside WPC Margaret Liles in the first carriage) and Jane Simpson in St. Bartholomew's Hospital on 10 June 1975 (also of 'crush syndrome').
9. For a detailed analysis of the injuries received by the casualties, see Medical Staff of Three London Hospitals (1975) – see endnote 10 below. Interestingly, their report suggests that a total of 113 casualties resulted from the Moorgate tube train disaster; the figure of 82 tallies with those casualties who were actually travelling on the train and listed by name in Appendix A of the City of London Police's official report (Fisher, 1975) but injuries were also sustained by responders and others which, presumably, account for the difference. Out of the 74 taken to hospital (although Fisher's figures suggest this was 75 with seven not attending hospital) 72 were treated in hospital and two were dead on arrival. Of those 72, 31 were discharged the same day and 41 were admitted.
10. Medical Staff of Three London Hospitals (1975) *Moorgate Tube Train Disaster – Part II: Clinicopathological Review*. British Medical Journal. 3, No. 5986, pp 729–731.
11. In contrast to (for example) the Old Bailey bombing which occurred just two years earlier on 8 March 1973 and within less than 200 yards of St. Bartholomew's Hospital.
12. Wikipedia takes the numbers of responders involved in the Moorgate Tube disaster from the National Archives website, which itself refers to the Lord Chancellor's Department file LCO 20/1102. However, that file does not actually quote the figures from an independent government source, but instead includes a copy of Marks' and Hallows' article from The Sunday Times dated 29 February 1976 which quotes the figures provided: "... a six-day operation involving 1324 firemen, 240 policemen, 80 ambulancemen, 16 doctors on the spot and the staffs of three hospitals, plus scores of helpers from voluntary organisations." The number of firefighters involved is confirmed in the official London Fire Brigade report on its response to the disaster (Milner, 1975) and repeated in Holloway's *Moorgate – Anatomy of a Railway Disaster* (1988) on page 89. However, the author's own research for this article suggests that the number of doctors involved was greater than the 16 quoted.
13. McNaughton, Lt Col I K A (1976) *Railway Accident: Report on the accident that occurred on 28th February 1975 at Moorgate Station on the Northern Line, London Transport Railways*. pp 1–20. London: Her Majesty's Stationery Office. ISBN 0-11-550398-6. Available at http://www.railwaysarchive.co.uk/documents/DoE_Moorgate1975.pdf (accessed 23 March 2019).
14. Before the body of Motorman Newson was even recovered from the wreckage, a headline on page 17 of The Sunday Times dated 2 March 1975 (No. 7916) asked "Did the driver 'neutralise' his deadman's lever?" The article continued: "In theory, a driver should keep his deadman's handle in operation all the time the train is moving. Then, if he lets go of it even for a split-second – if he faints, or loses his grip – the handle will fly up, shutting off the power and slamming on the emergency brakes. In practice, it is very easy in a Northern Line cab to lock the deadman's handle out of action and 'coast' the downhill runs. The reason for doing so is simple enough. Holding a spring-loaded handle down all day is not as simple as it sounds – especially in the knowledge that one tiny slip may bring the train to a shuddering and unplanned halt in mid-tunnel." However, this possibility was soon

- discounted when rescuers reached the motorman's cab and found that the master controller was still in the 'Series' position (half power) and the reverser key was in the 'Forward 1' position.
15. In an article entitled 'A train to nowhere' published in Woman magazine on 4 March 1978, Laurence Marks says that Prof Simpson discounted epilepsy due to there being no sign of a bitten tongue.
 16. The Police Experience at Moorgate – C/Insp. Brian E Fisher MBE, City of London Police, pp 57
 17. At the time of the Moorgate disaster, the doctor in charge of medical activity at the scene of an incident was known as the 'Site Medical Officer'. This term has subsequently changed to Medical Incident Officer, Medical Incident Commander and, more recently, to Medical Advisor. Curiously, the National Archives file PREM 16/332 refers to Dr Alan Chait from The London Hospital as the 'Site Medical Controller' but no such term has ever been in official use.
 18. In 1975 the policy on preventative tetanus toxoid vaccine was different to today's schedules. It was the city's Public Health Department that recommended that firefighters could be given booster doses whilst at the scene as it would seem that routine maintenance of immunity via their own occupational health service was in doubt. As doctors from the North East London Accident Unit (Chingford and District) were providing 24 hour medical cover in shifts for the recovery phase they agreed to provide the service at the station. It was not the Site Medical Officer's decision alone but was taken on the recommendation of Dr Dilwyn T Jones, the Medical Officer of Health for the Port and City of London. Interestingly, Hines (personal communication, 2019) reports that there was also a discussion about the risks of leptospirosis (Weil's disease) from rats' urine within the tunnel; however, it was decided against giving everyone prophylactic penicillin due to the greater risk allergic reaction and chances of contracting the disease were actually very small.
 19. Jones, R M (2015) End of The Line: The Moorgate Disaster. pp 1-199. Bridlington: Lodge Books. ISBN 978-1-326-21141-7.
 20. Pounder, D J (1998) Dead sober or dead drunk? May be hard to determine. British Medical Journal. 316, No. 7125, pp 87.
 21. In his book End of the Line: The Moorgate Disaster published in 2015, Richard M Jones contends that sugar was present in Leslie Newson's body from the three heaped teaspoons of sugar he took in every cup of tea – and that he had consumed at least three cups of tea (containing at total of at least nine teaspoons of sugar in "just a few hours") on the morning of the crash. He argues: "This would account for a slightly higher alcohol reading in Les's blood than the other eight bodies examined nearby. Add to that the fact that he was in his own cab at the very top of the tunnel wall (heat rises remember!) and you have a higher temperature in a more confined space with a hell of a lot of sugar; add the heat factor of four days and 100 degrees and you have a teetotal man who has now the blood of a heavy drinker." (pp 140)
 22. Milner, J (1975) A struggle for life. Fire. 68, No. 840, pp i-viii (special supplement).
 23. Jones and Pounder (see endnote 24 below) actually say "Body disruption of a severity which commonly occurs in aviation accidents is associated with extensive microbial contamination and a resultant higher probability of post mortem ethanol production" but comparable body disruption was seen in the case of Motorman Newson during the Moorgate disaster.
 24. Jones, A W and Pounder, D J (1998) Measuring blood alcohol concentration for clinical and forensic purposes. pp 340-369. In Karch, S. B. (Ed.) Drug abuse handbook. Boca Raton, Florida: CRC Press. ISBN 0-8493-2637-0.
 25. Leslie Newson served as a gun loader in World War II and his work had a permanent effect on his hearing; the cumulative noise of the guns being fired perforated an eardrum and in fact he was deaf in one ear.
 26. The names listed on the memorial were taken from a list supplied by the Coroner's Office; however, it contained some major spelling errors (many of which were corrected by Jones) but even today there are several names that are slightly misspelt.
 27. Winch, R D, Hines, K C, Booker, H T and Ferrar, J M (1976) Disaster procedures report: Report following the Moorgate train crash on 28 February 1975. Injury: the British Journal of Accident Surgery. 7, No. 4, pp 288-291.
 28. Milner, J (undated) The Fire Brigade at Moorgate. pp 43-50.

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