DEPARTMENT OF TRANSPORT

RAILWAY ACCIDENT

Report on the Collision that occurred on 11th October 1984 near Wembley Central Station

IN THE
LONDON MIDLAND REGION
OF BRITISH RAILWAYS

LONDON: HER MAJESTY'S STATIONERY OFFICE

£4.90 net

RAILWAY INSPECTORATE
DEPARTMENT OF TRANSPORT
2 MARSHAM STREET
LONDON SW1P 3EB
21st February 1986

SIR,

I have the honour to report for the information of the Secretary of State, in accordance with the Direction dated 16th October 1984, the result of my Inquiry into the collision between a passenger train and a Freightliner train that occurred at about 18.04 on Thursday 11th October 1984 near Wembley Central Station in the London Midland Region of British Railways.

Shortly after 18.00 a Freightliner train consisting of 20 wagons headed by two electric locomotives was signalled from a goods line on to the Down Slow line just to the south of Wembley Central Station. It was negotiating the crossovers leading from the goods line to the Down Slow when its eleventh wagon was struck by an eight-car Euston to Bletchley electric multiple-unit passenger train which had passed the protecting signal at Danger. The impact deflected the passenger train to its left towards the adjacent Fast lines. The leading two coaches were derailed and overturned on to their sides and all the following coaches, except the rearmost one, followed the leading two into derailment but remained coupled together and upright. Five vehicles on the Freightliner train were also derailed.

The emergency services (fire, police and ambulance) were quickly called and were all on the scene within about twelve minutes. I regret to report that three passengers died in the accident. A further 17 passengers, together with the driver of the passenger train, were taken to hospital but only two needed to be detained. One of the detained passengers was released on 15th October and the other on 1st November.

Protection of the running lines was carried out by various members of BR staff, assisted by one of the passengers. Some signals were automatically placed to Danger by the occupation of track circuits by the overturned coaches, and others were placed to Danger by the signalman in Willesden Signal Box.

Extensive damage was caused to track, signalling and overhead line equipment and the accident blocked all main lines into and out of Euston. The Down Fast line was restored at 18.22 on Friday 12th October, although it was again closed to traffic on Sunday 14th October to enable repairs to be completed. The Up Slow line was restored to traffic at 18.54 on Saturday 13th October followed by the Up Fast line at 12.30 on Sunday 14th October. The Down Slow line was restored at 06.00 on Monday 15th October.

At the time of the accident the weather was fine though slightly overcast. It was still daylight and visibility was good.

DESCRIPTION

The site and signalling

1. The collision occurred on the West Coast Main line where the connection between the Up Slow and the Down Slow (Points 314) intersects with the Down Slow line, 7 miles 1,575 yards from Euston. At this point there are five running lines. From West to East they are the Down Fast, Up Fast, Down Slow, Up Slow, and the bi-directional Up and Down Goods. The maximum permissible speeds are 110 mile/h on the Fast lines, 75 mile/h on the Slow lines, 20 mile/h on the Up and Down Goods line, and 15 mile/h through the connections. The Fast and Slow lines are electrified on the 25kV overhead line system. To the west of the West Coast Main line are the Up and Down DC-electrified Watford lines which are also used by London Regional Transport's Bakerloo Line trains. These lines were not affected by the accident.

2. On the main lines, trains travelling in the Down direction approach Wembley Central Station, situated at 8 miles 04 yards, on a right-hand curve following a long straight. The gradient between the 7 and 8 mile posts rises in the Down direction at 1 in 339.

3. The signals on the main lines are 4-aspect colour-lights controlled from Willesden Signal Box (5 miles 1,427 yards), and trains are signalled in accordance with the Track Circuit Block Regulations. The signalling was installed in 1965 in conjunction with the electrification of the WCML and conforms to the latest BR standards. The Up and Down Goods line is equipped with 3-aspect colour-light signals and the Track Circuit Block Regulations (Permissive) apply between Signals WN31 and WN26 in the Down direction. The four signals on the Down Slow line between Willesden Signal Box and Wembley Central Station are suspended from gantries spanning the tracks: these gantries also carry the equally spaced Down Fast line signals. Each of the signals is placed such that the red aspect is between 4.57 m and

4.87 m above rail level and 0.74 m to the left of the left-hand rail of the track concerned. The driver's eye level in the passenger train was approximately 2.65 m above rail level.

4. The method of route selection in Willesden Signal Box is by the sequential operation of entrance and exit buttons. Before any signal can show a proceed aspect all the points in the route must be set, locked and electrically detected in the correct position, and all relevant track circuits must be proved clear. Once the route is set and the signal has shown a proceed aspect the signalman cannot cancel the route until a time release of 2½ minutes has operated. This provides an added safeguard against the possibility of conflicting routes being set.

5. All main line signals are equipped with the standard BR automatic warning system (AWS). This consists of a track-mounted magnet situated some 183 m on the approach to the signal and connected electrically to it, and corresponding train-mounted equipment. On approaching a green signal a bell sounds in the cab and a visual indicator displays an all-black aspect. No action is required by the driver. If the signal displays a preliminary caution (double-yellow), caution (single yellow), or stop (red) aspect a horn sounds in the cab and the driver must acknowledge the warning by depressing a button on his control desk within about 2½ seconds otherwise the brakes are automatically applied. The visual indicator changes to black and yellow. AWS is an aid to the driver, but does not absolve him from his responsibility to observe and work to the lineside signals.

6. The plans at the back of the report show the site and signalling together with the position of the two trains after the collision.

The trains

7. The Freightliner train was 4D62, the 16.00 Willesden to Holyhead. It consisted of electric locomotive 86006, locomotive 85035 (being hauled dead) and 20 loaded Freightliner vehicles. The train was 439.8 m long overall and weighed 1,302 tonnes. Its maximum permitted speed was 75 mile/h.

8. The passenger train was 2A85, the 17.54 Euston to Bletchley. It consisted of two 4-car Class 310 electric multiple-units Nos. 067 (leading) and 086. The train was 161.6 m long overall with a tare weight of 316 tonnes. Its maximum permitted speed was 90 mile/h although the line limit on the Slow line at Wembley was 75 mile/h. Its seating capacity was 636, made up of 50 first and 586 second-class seats. In the driver's cab the controls included a 'deadman's handle' which the driver has to keep depressed otherwise the brakes apply.

Evidence

9. *Mr. J. Peplar* had been the BR Area Supervisor at Willesden since 1968. He was on duty in Willesden Signal Box at the time of the accident. The Holyhead Freightliner train was timed to leave Willesden at 16.00 but had been delayed that evening by the late arrival from Felixstowe of vehicles which were to form part of the train. It was unusual for the Freightliner to be delayed in this way, it being normally signalled out on to the Down Slow line at about 16.15. The train left Acton Lane at 17.26 and arrived at Signal WN26, the signal controlling its move on to the Down Slow line, at 17.34. At this time traffic was heavy on the Down Slow line and Mr. Peplar had to decide on the best time to allow the Freightliner to proceed. His aim was to try to get the Freightliner out behind a fast train and in front of a slower one so that it would cause minimum delay to following trains. Mr. Peplar knew that trains would be leaving Euston on the Down Slow line at 17.45, 17.51, 17.54 and 17.56, and that his aim could best be achieved by signalling the Freightliner out between the 17.51 and the 17.54. He therefore decided to do this and instructed the signalman accordingly, this being done at about 17.40. He realised at the time that the departure of the Freightliner would entail slowing or stopping the 17.54 train but he anticipated that the check would be only a short one and that once the Freightliner was out on to the main line it would accelerate up to 75 mile/h and cause no further delay to the 17.54 or following trains.

10. Mr. Peplar saw the 17.45 and 17.51 ex-Euston trains go by and watched the signalman set the route for the Freightliner train from Signal WN26 to WN206. He saw the route lights illuminate on the panel and Signal WN26 show a proceed aspect. Signal WN27 was indicating that it was at Danger. At this time the 17.54 train, 2A85, was shown as being somewhere between Signals WN145 and WN109; he estimated that it would be held for about two minutes at Signal WN27. He watched the occupation of track circuits as the Freightliner moved out on to the Down Slow line and saw that 2A85 was by then approaching Signal WN211, which would be at double-yellow. His attention was then diverted elsewhere until, a few moments later, the signalman called out and he saw that a large number of track circuits in the Wembley Central area were showing occupied, including those on the Up and Down Fast line and the Up Slow. The signalman immediately replaced all the protecting signals to Danger. Looking at the diagram, Mr. Peplar noted that the description for 2A85 was showing in the train describer berth at Signal WN27. Shortly afterwards this description was replaced by that of the following train, 2GO1, the 17.56 from Euston. In the meantime, telephone messages were being received indicating that there had been a

serious collision. Mr. Peplar called for the emergency services, at 18.07, but was told that they were already on their way.

11. Mr. Peplar had started duty that day at 14.30. Between then and the time of the accident there had been no reported faults or irregularities with any of the signalling equipment in the Wembley area and no failure of the power supplies.

12. The signalman on duty was *Signalman E. A. Braithwaite*. He had worked in Willesden Signal Box for about four years. He confirmed that Mr. Peplar had decided to route the Freightliner out between the 17.51 and the 17.54 trains and had instructed him accordingly about 10 minutes before the move was to be made. After the Freightliner had been at a stand at Signal WN26 for some time its driver telephoned to ask when he would be leaving and Braithwaite told him that he would be following the passenger train that was just going by. This train however was the 17.45 and Mr. Peplar reminded him that the Freightliner would be following the next one, the 17.51. Braithwaite had already taken Signal WN27 out of automatic operation in preparation for the Freightliner move and he therefore set the route manually for the passage of the 17.51. When this train had passed, he set the route for the Freightliner, knowing that the 17.54 was then in the vicinity of Signal WN109. He confirmed that the route lights illuminated correctly, with Signal WN26 showing a Proceed aspect and Signal WN27 at Danger.

13. After watching the track circuits ahead of WN26 become occupied indicating that the Freightliner was on the move, Braithwaite left the panel for a moment. On returning, he saw track circuits showing occupied all over the Wembley Central area. He noted that the description of the 17.54 train was in the berth of Signal WN27 and that of the Freightliner at Signal WN26. He replaced all relevant signals to Danger and then began to receive telephone calls reporting the collision. At some stage the driver of the 17.54 came on the telephone but Braithwaite did not challenge him with having passed Signal WN27 at Danger even though he had already concluded from the indications on the panel that the driver must have done so.

14. *Driver J. W. Marvesley* was the driver of 2A83, the 17.51 from Euston. He left Euston on time and ran at line speed on green signals to Wembley Central and beyond. The AWS was working and he received the correct bell signals and visual indications in the cab at every signal. Although he had only a few months experience as a qualified driver he knew the line well and the characteristics of the Class 310 units. He said that the uneven signal spacing in the Willesden area demanded some care but that the braking distances available were entirely adequate. He knew that approaching Signal WN27 on the Down Slow line the paired Fast Line signal, WN28, came into view first but he had never found this confusing.

15. The Freightliner train was driven by *Driver J. Atkinson*. He had worked this particular service on numerous occasions and said that it was rare for it to be delayed. Its departure was however delayed on the day of the accident and it was approximately 17.30, one and a half hours behind the scheduled departure time, when the train arrived at Signal WN26. Driver Atkinson watched two passenger trains pass on the Down Slow line and two expresses on the Down Fast and then spoke to the signalman on the signal post telephone. He was told that he would be going on the Slow Line after the next Down passenger train. In fact, two passenger trains went by in quick succession and shortly afterwards the points (315) changed and Signal 26 cleared to a single yellow aspect with a route indication for the Down Slow line. Atkinson started the train without appreciable delay and increased speed to 15 mile/h through the crossovers leading to the Down Slow line. About three quarters of the way along the platform at Wembley Central he felt an unusual 'tug' and the train came to a stand. He looked back and saw some of the wagons out of line and concluded that they were derailed. He therefore secured the train, put track circuit operating clips on the Up Slow line, and telephoned the signalman who told him that there had been a collision. During the period of approximately 25 minutes that he had been held at Signal WN26, the signal aspect had remained at Red. After it had cleared and he had taken the train onto the Down Slow line the next signal ahead, WN206, showed single yellow but this changed to double yellow and then to green after the train had come to a stand.

16. The guard of the Freightliner train, *Guard D. Bloxham*, confirmed his driver's evidence. After the train had stopped on the Slow line, he saw that wagons in the centre of the train were out of line and on leaving the train he saw the overturned leading coach of the passenger train. He immediately put down t.c. clips on the Up Fast line and contacted the signalman, giving him the UN code numbers of the Freightliner cargo classified as dangerous goods. These goods were in containers on the 13th and 14th vehicles, both of which were derailed, and consisted of tars, road asphalt, bitumen and a small quantity of photographic chemicals. The containers were undamaged and none of the material was released.

17. The guard of 2A85, the 17.54 Euston to Bletchley train, was *Guard L. A. Joseph*. He had about seven years experience of working trains on the Down Slow line out of Euston. On the day of the accident he met the driver of the train, Driver Armstrong, at about 17.50 at Euston. He had worked with Driver Armstrong from time to time over a number of years. On this occasion they exchanged a few words and Armstrong appeared perfectly normal and his usual self. They left Euston on time, with Joseph travelling in the rear brake compartment in the seventh out of the eight coaches. The journey as far as Wembley

was uneventful, with the train slowing for the permanent speed restriction at the entrance to Primrose Hill tunnel and thereafter running at or near its line speed of 75 mile/h. Joseph did not think that there was any brake application or reduction in speed in the Willesden area but approaching Wembley Central there was a sudden application of the brake and he saw the brake gauge needle falling. The brake application continued for some five seconds and then there was a noise of scraping along the side of the vehicle followed immediately by a violent deceleration and Joseph was thrown to the floor. He estimated that the speed of the train had reduced to between 50 and 60 mile/h at the moment of impact.

18. On leaving the train, Guard Joseph met one of the passengers, Mr. Richard Hope, who identified himself as the Editor of the Railway Gazette and who offered to assist in protecting the train. Whilst Mr. Hope put down a t.c. clip and detonators and confirmed that the traction power had been switched off, Joseph assisted passengers in the train.

19. *Mr. Richard Hope*, Editor of Railway Gazette International, was travelling in the centre of the rear coach of the 17.54 train, facing the direction of travel. He had been a regular traveller on the line for some 20 years and usually travelled three or four times a week on the 17.54 service. On the day of the accident the journey from Euston was quite normal, with the train running at its usual speed of 70 to 75 mile/h after the permanent speed restriction at Primrose Hill tunnel. Approaching Wembley there was a sudden application of the brakes, sufficient to attract Mr. Hope's full attention. He assumed at once that it was an emergency application since it followed a period when the train had been running at constant speed and under power. The brakes remained applied for about four seconds after which there was a violent deceleration followed by three or four surges lasting in all about nine seconds. As the speed dropped to about 25 mile/h, there was a grinding noise and a Freightliner container appeared against the right hand side of the coach. Mr. Hope estimated that the train's speed had been about 70 mile/h before the brake application and 60 mile/h on impact. The time on his watch, which he checked and found to be accurate soon after the accident, was 18.05.

20. As the train came to a stand Mr. Hope looked forward along the left hand side of the train. He saw the leading coaches leaning over the Up Fast line and realised at once the danger of a second collision if a train should approach from the north. He jumped down, found one t.c. clip in the rear cab, and applied it to the Up Fast line. At this point he saw the guard, who acknowledged his help. Moments later, as the dust cleared, he saw that one of the leading coaches was lying across the Down as well as the Up Fast line. Since it appeared more likely that the coaches were shorting out the track circuit on the Up line, he transferred the t.c. clip to the Down line before going to the nearest signal (WN26) and telephoning the signalman at Willesden Junction. The latter was able to assure him that all lines were protected by signals and that the emergency services had been summoned. After assisting passengers to leave the train and make their way to the station Mr. Hope left the site. Mr. Hope was thanked by the Railway Officers at the public hearing for his prompt and valuable assistance.

21. *Mr. S. J. Owens* was a passenger in the front coach of the 17.54 train. He too was a regular traveller on the line. He was sitting at the back of the coach, facing forward. He described the journey as quite uneventful until approaching Wembley, with the train running at a normal speed. There were then three sudden and distinct jerks, which he took to be the driver applying the brakes, before the coach began to rock violently. This continued for several seconds and the coach then turned over onto its left hand side. Mr. Owens held on to the seat in front for as long as he could as the train continued forward and then fell to the side of the coach, which by then was on the ground. Both his knees were badly bruised and his hand grazed. Other passengers around him were more seriously hurt. The connecting door to the second coach appeared to be jammed so they stayed in the coach for about five minutes. Some, including Mr. Owens, then climbed out onto the right hand side of the coach where they waited until assisted down by firemen. On the assumption that the train's normal speed was 75 mile/h Mr. Owens estimated that its speed would have been reduced by the brake application to between 50 and 60 mile/h at the time of collision.

22. *Driver L. Oakes* was the driver of the 17.56 Euston to Birmingham train, which followed the 17.54 on the Down Slow line. He had long experience of working trains on this line out of Euston and of the class 310 units. He left platform 9 at Euston within a minute of right time with a double-yellow signal and the signal approaching Primrose Hill tunnel was at single yellow. After observing the 20 mile/h speed restriction and passing through the tunnel the signals from then on were all at green until approaching Signal WN97 at Willesden, which was at double yellow. At this point Oakes made an initial brake application, reducing speed from 75 mile/h to about 60 mile/h. The next signal, WN211, was at single yellow and at this stage he could see Signal WN46 ahead and this was showing a single yellow. He allowed the train to continue at about 60 mile/h until, rounding the curve, he saw Signal WN27 at red. He had no difficulty in bringing the train to a stand short of Signal 27. He confirmed that before Signal 27 came into view he could see the paired signal on the Down Fast line (Signal 28) and that this was showing green. The AWS equipment was working correctly throughout the journey. As he stopped the train at Signal 27 he could see that there had been an accident ahead although the train ahead was clear of the overlap track circuit of Signal 27.

23. Driver Oakes said that he had never experienced difficulty with the signalling in the Willesden area. On the day of the accident he remembered that the weather conditions were good and that there had been no glare from the sun. He had not lowered the sun visor. Signal 27, in his opinion, was showing a perfectly clear red aspect as he approached.

24. *Mr. P. Hersey* was the senior Signal and Telecommunications Department technician on duty in Willesden Signal Box. He was told of the accident soon after it happened and he went straight to the operating floor. There he noted the relevant indications on the panel. Points 314 and 315 were indicating 'reverse' and the white route lights were showing that a route had been set from Signal 26 to Signal 206. There were train descriptions on the panel but Mr. Hersey did not make a note of them. He confirmed that, while some work had been undertaken on the train describers and on points during the afternoon, none of this affected the Down Slow line.

25. The detailed testing of the signals and signalling equipment commenced at about 22.30 under the direction of *Mr. C. G. Wheeler* of the Regional Signal and Telecommunications Engineers Department. He first tested the relays and interlocking connected with Signal WN27 and then tested the cables between the relay rooms and Signals 27 and 46. Megger tests were carried out on all cables, core to core and core to earth, and the insulation checked. Earth tests were also carried out in the relevant relay rooms. This work occupied most of the night. Soon after 06.00 he carried out aspect sequence tests on Signals 27, 46 and 211 and tested the AWS magnets at each of the signals. As a result of all these tests, Mr. Wheeler was satisfied that the signalling equipment was functioning correctly, that the driver of the 17.54 passenger train would have received the correct signal aspects with appropriate AWS indications as he approached Wembley Central, and that the interlocking between the routes for the passenger train and the Freightliner train had functioned correctly.

26. Further tests were carried out during the course of 12th October by *Mr. K. G. Hincks*, the S. & T. Commissioning Assistant, Birmingham. Having checked the work done during the night by Mr. Wheeler, he carried out full functional testing of the interlocking between Signals WN26 and WN27, the route holding conditions, and the approach locking. Before starting these tasks, it was necessary to provide local energisation of track circuits that had been damaged in the course of the accident and when this was done it was possible to see that the route for the Freightliner train from Signal 26 was still set and locked. Within the signal box, he tested the timing necessary before a signalman could alter a route once it had been set. He found that if a route had been set from Signal 27 and a train on the Down Slow line had occupied track circuit 104 or any of the subsequent track circuits, it would have required a time of 3 mins. 10 secs. before the route could be cancelled and a new route set from Signal 26.

27. Whilst testing Signal WN27 Mr. Hincks found that the red aspect lamp voltage was 10.4 volts which was low and close to the limits of tolerance allowed. Whilst this would have affected the light intensity to some degree he did not believe that it would be noticeable to a driver. He himself observed the red aspect from various distances on the approach and it appeared as a fully normal aspect. Summing up the results of all the tests Mr. Hincks said that he was fully satisfied that Signal WN27 was properly at Danger as the 17.54 train approached it and that the two previous signals had given the correct yellow and double yellow warnings. At all three signals, the associated AWS was functioning correctly.

28. Examination and testing of the 17.54 passenger train was carried out from 21.00 onwards under the direction of *Mr. P. J. Vidler*, the Area Rolling Stock Engineer, Willesden. Within the leading cab the brake controller was in the 'emergency' position, the main controller was in the 'off' position, the reverser was in the 'forward' position, the driver's safety device was operative, and the miniature circuit breakers were correctly set. Damage to the equipment had allowed the air to leak away and thus the brake cylinder pressure and the main reservoir pressure gauges were both reading 'zero'. The AWS visual indicator was showing all black, although the indicators in the trailing cab of the leading unit, and in both cabs of the second unit, were showing black and yellow. Mr. Vidler agreed that tests carried out at the BR Research Centre at Derby following an accident near Oldbury in 1970 had established that an indicator could easily be altered as a result of shocks or damage to the wiring during the course of an accident.

29. Because of the damage to the leading two vehicles, it was not possible to carry out a 100 per cent check of the train's braking system. However, tests on the remaining vehicles, together with an examination of the equipment on the leading ones, were sufficient to enable Mr. Vidler to say with confidence that the braking system on the train would have been working satisfactorily before the accident. There was no reason to suppose that the driver would not have received the proper AWS warnings at any restrictive signal.

30. Evidence on theoretical calculations designed to establish the probable speed of the passenger train on impact with the Freightliner train was given by *Mr. I. G. T. Duncan* of the BR Engineering Development and Research Directorate. He had considered the distance travelled by the train after impact, the distance travelled by the two leading vehicles after they had overturned, and compared the results with the evidence available from previous accidents. His conclusion was that the speed on impact was likely to have been 57 mile/h, with a possible error of plus or minus 5 per cent.

31. Based on the performance characteristics of the train, Mr. Duncan calculated that a full brake application would have reduced the train's speed from 75 to 57 mile/h over a distance of approximately 263 metres. Thus, if the train had been travelling at 75 mile/h and the speed on impact was 57 mile/h the brake application would not have commenced until the train had travelled approximately 103 metres beyond Signal WN27.

32. I was unable to question the driver of the 17.54 train, *Driver R. Armstrong*, at the first public hearing of evidence since papers had been forwarded to the Director of Public Prosecutions. I was informed on 18th January 1985 that no criminal charges were to be brought against Driver Armstrong, and I re-opened the Inquiry on 15th February.

33. Driver Armstrong was aged 63 at the time of the accident. He had joined the Railway as a messenger boy at Carlisle in January 1936 and worked his way up as a cleaner and fireman on steam locomotives until qualifying as a driver in 1954. He had worked as a driver ever since, mostly on the West Coast Main line out of Euston, where he was based. On Tuesday 9th October he worked a train to Manchester and another back from Stoke to Euston and booked off duty at 23.00, returning home to Leighton Buzzard. The next day was a rest day and he spent it in the house or garden apart from some shopping. After a reasonable night's sleep he got up at about 7.30 on the Thursday and spent the morning in the house before leaving for work. He booked on duty at Euston at 15.04. He had originally been rostered to drive the Advanced Passenger Train (APT) but this had been cancelled earlier in the week and he was expecting instead to travel as a passenger to Northampton and to work a train back to Euston from there. However, on booking on he was told by the inspector, Mr. Shingler, that this too had been cancelled and that there was no immediate job for him. He read the late notices and spent about half an hour in the mess room and was then told by Mr. Shingler that he was to work the 17.54 service to Bletchley.

34. After preparing the train and carrying out a brake continuity test, the results of which were satisfactory, Armstrong drove the train to platform 11 where he was joined by Guard Joseph. They left Euston, on time, with a single yellow aspect on the platform starting signal and a route indication for the Slow line. The following signal was at double yellow and the next two were both at single yellow. These led to the junction signal at Camden which was at red but which cleared to green as Armstrong approached. On the rising gradients he had not had to apply the brakes. The next signal was at double yellow and the subsequent one, approaching Primrose Hill tunnel, was at single yellow. He braked for the 20 mile/h permanent speed restriction and continued at reduced speed expecting the next signal, at South Hampstead, to be at red. When it came into view it was green so he accelerated, reaching the line speed of 75 mile/h between Queen's Park and Kilburn. Armstrong had assumed from the signals he had received that he had been closely following another train out of Euston.

35. From South Hampstead up to and including Signal WN97 at Willesden all signals were at green. Passing Willesden Signal Box, he saw Signal WN211 ahead at double yellow and in the distance beyond it Signal WN46 at single yellow. Up to this point he had received correct AWS indications at every signal. Approaching Signal WN211 the horn sounded and he cancelled the warning and at the same time shut off the power. At the signal he made a light brake application of 15–20 lbs. He believed that passing Signal 211 the train's speed had been about 65 mile/h.

36. Although at this point he had seen the next signal, WN46, some 675 yards ahead, at single yellow Armstrong had no recollection at all of passing this signal and could not confirm its aspect as he passed it or recall whether or not he had received the AWS warning and cancelled it. He remembered nothing after passing Signal WN211 until he heard the AWS horn sound as he approached Signal WN27. This, in his words, 'brought me back to life again' and he made a full emergency brake application and released the driver's safety device. He did not see the aspect of the signal and could not say whether or not he had cancelled the AWS horn or whether it had continued to sound. He believed that he had applied the brakes somewhere between the AWS magnet (200 yards before the signal) and the signal, but he could not be sure. At about this point he became aware that a Freightliner train was crossing from the Goods line onto the Down Slow line ahead of him and that he was going to collide with it. He stood up and braced himself as the train struck the side of the Freightliner and turned over onto its left side.

37. When the train had come to rest Armstrong found himself dazed but apparently unhurt. He did not touch any of the controls. With difficulty he climbed out of the cab and found many passengers sitting on top of the coach. He called to them to beware of the overhead wires, dropped down between the first and second coaches, and went to telephone the signal box. He was told that all lines were protected and the current isolated so he returned to the train, obtained a ladder from the brake van and assisted passengers down from the train. By this time the emergency services had arrived. He was then asked by a police officer to go to a waiting room on the platform at Wembley Central. After making a statement he was taken to hospital for examination and then returned to Euston where he was interviewed by railway officers.

38. Between the time of the accident and his arrival back at Euston, Armstrong was questioned at different times by five different police officers. He told the first one, at about 18.20, that he had mistaken the Fast line signal for the one on his line and that he had passed the latter at Danger. Twenty minutes later he told a second officer that he had passed what he believed to have been a yellow signal and then realised too late that it was a red one. He told the third officer that he had looked ahead and seen a green signal and continued until he realised at the last moment that he had passed a signal at Danger. To the fourth he said that he thought the last signal was at yellow until he had passed it and then realised it was red, and to the fifth he said that he saw the signal at red but was not quick enough to prevent a collision. I questioned Armstrong about these statements to the police. He could not remember making some of them but he felt sure that he could not have mistaken signals on the Fast line for his own nor did he think that he could have fallen asleep otherwise it is unlikely that he would have cancelled the AWS at Signals 211 and 46, and he accepted that he must have done this. Ever since the accident he had tried to remember just what had happened but, whilst he could recall all the details of the journey, including the signal aspects, up to and including passing Signal 211, he had no memory at all of the events between passing 211 and closely approaching Signal 27.

39. Earlier in the year, Armstrong had been away from work for some seven weeks. On 20th July, whilst on holiday, he had been descending from the loft at his home carrying a 44 kg bag of dog food when the ladder broke and he fell about 10 ft. He could not remember whether he had lost consciousness or not but he was badly bruised. He remained at home for two days and then went to see a doctor. His own doctor was away so he saw a number of other doctors in the weeks following the accident. He was given pain-killing tablets but the first ones made him feel morbid and bad tempered. He was given others a week later but after taking these he felt dizzy and on one occasion, about three weeks after his fall, he drove his car into the kerb. After this he stopped taking the tablets. He did not believe that any of the doctors he saw knew that he was a train driver and he did not tell them. None of them warned him that the tablets might make him drowsy. He did not know what the tablets were called and he had not read the labels on the bottles. After stopping taking the tablets in mid-August he took no more up to the time of the accident on 11th October. In early September he was told that he was fit to return to work and he did so on 9th September. He was not seen by a railway doctor between the time of his return and the time of the accident.

40. After returning to work he did not drive a train until 14th September after which he resumed his normal duties. On 2nd October he caught a heavy cold and stayed at home for five days, returning to work on 7th October, four days before the accident. Since stopping the pain-killing tablets in mid-August there had been no more dizzy spells but he had sometimes experienced flashing lights in his eyes. This did not last long and did not occur regularly. They had occurred when he was driving his car on his rest day on 10th October, the day before the accident. He had stopped his car and waited for several minutes until the flashing, which he described as a 'weaving, coloured pattern' had stopped. He did not think that he had ever experienced these flashing lights when driving a train.

41. *Dr. R. P. G. Dickerson*, British Railways Chief Medical Officer, said that a driver on BR can continue to drive trains until the age of 65, provided he remains medically fit. Between the ages of 45 and 60 a driver is medically examined every five years, and every year after 60. Driver Armstrong's last routine examination had been in July 1984, shortly before his accident at home. The examination had included a review of his health since the previous examination, tests of eyesight, colour vision, blood pressure, heart, lungs, and a general physical examination. If anything in a driver's medical history suggested the possibility of ischaemic heart disease, an electrocardiogram examination was carried out but this had not been necessary in the case of Driver Armstrong. Dr. Dickerson explained that it had been the practice at BR for any driver who had been away sick for more than a month to be examined by a railway doctor on his return. However, in cases where the illness could have some bearing on the fitness to drive it might be necessary to examine a man who had been away for only a week or two so the need for examination was now left to the discretion of the Regional Medical Officer concerned. So far as Driver Armstong's return to work after his accident at home was concerned, the Area Manager at Euston had telephoned the Medical Officer asking whether Armstrong should be examined. The Medical Officer had replied that this was unnecessary in view of the nature of the injury shown in the GP's certificate and the satisfactory medical examination carried out in early July.

42. Dr. Dickerson himself examined Driver Armstrong on 17th October, six days after the accident. He questioned him closely about his fall at home in July. From the fact that he could recall every detail of the fall Dr. Dickerson concluded that there had been no concussion or loss of consciousness. Similarly, the fact that he was able to recall in such detail the early stages of the journey on 11th October, and the events immediately following the collision, showed that there was no retrograde amnesia such as would be likely if he had hit his head in the course of the accident. In seeking to explain the apparent loss of concentration or of memory during the short period between passing Signals 211 and 27, Dr. Dickerson had considered the possibility of epilepsy, petit mal, migraine and other conditions but had

found no evidence whatsoever that these might be responsible. His examination had included eye tests, an electrocardiogram and all the normal clinical tests and he had found no abnormalities at all.

43. Subsequently, Dr. Dickerson discussed the case with Driver Armstrong's GP and they concluded that an examination by a consultant neurologist was desirable. Armstrong was seen by a consultant on two occasions during November 1984. During these examinations he disclosed that the bright lights in his eyes (which he had not mentioned to Dr. Dickerson) had recurred from time to time during the course of many years. In his report, the consultant described these as highly suggestive of migraine despite the absence of headache, nausea or vomiting. He concluded nevertheless that there was nothing in Armstrong's past medical history or that of his family to suggest a pre-disposition to attacks of loss of consciousness nor did he consider that Armstrong's fall on 20th July had caused any injury which pre-disposed to his losing control of the train on 11th October. He had been unable to identify any specific features of Armstrong's blank spell that might suggest an epileptic event, and he considered this unlikely. Similarly, Armstrong's apparent retained ability to cancel the AWS warnings seemed to rule out any syncopal episode. The consultant had then mentioned the unusual condition known as transient global amnesia which can occur in middle-aged or elderly men and in which the patient continues to perform fairly complex and relatively automatic and appropriate tasks with no subsequent recollection However, transient global amnesia generally persists for several hours and, being unaware of any reports of this condition lasting only a few minutes, he had concluded that this was an unlikely explanation of Driver Armstong's lapse.

44. Based on his own examination of Driver Armstrong, the opinion of Armstrong's GP, and the report by the consultant neurologist, Dr. Dickerson considered that nothing had been found to provide a medical explanation of Driver Armstrong's apparent lapse. He nevertheless warned that this did not totally exclude the possibility of an undetected, and possibly undetectable, medical condition having caused a temporary loss of concentration or memory.

Subsequent Investigations

45. In the absence of a medical explanation, it seemed necessary to conclude that Driver Armstrong, a highly experienced driver, had received and understood the warning given by the double-yellow aspect at Signal 211 and had then totally ignored the two following signals, one at single yellow and the other at red, whilst at the same time cancelling the AWS warnings at each signal. Since this seemed so completely at variance with the alert way in which Armstrong had been driving up to the time he passed Signal 211, and with the impression I had gained of his competence and integrity, I discussed the whole case with Dr. John Taylor, the Medical Adviser to the Secretary of State for Transport. Dr. Taylor's principal concern is with the medical aspects of the driving of road vehicles and he has considerable experience of the medical factors involved in road accidents. Having studied the case, Dr. Taylor concluded that there was sufficient similarity with other documented cases involving the drivers of road vehicles to make further examination of Driver Armstrong advisable. He therefore, with my full agreement, arranged for Armstrong, who had by now left the railway service, to be examined by a specially constituted Medical Board. The Board consisted of the following:

In the chair: Dr. Christopher Earl, M.D., F.R.C.P., Consultant Neurologist to the Middlesex, National, Moorfields Eye and Edward VII Hospital for Officers, who is the civilian neurological consultant to the Royal Air Force, Vice President of the Medical Defence Union and also chairs the Secretary of State for Transport's Honorary Medical Advisory Panel on Driving and Disorders of the Nervous System.

Dr. Maurice Parsonage, B.Sc., M.B., Ch.B., F.R.C.P., D.C.H., Consultant Neurologist and Medical Adviser to the British Epilepsy Association and former President of the International League Against Epilepsy; member of the Secretary of State's Honorary Medical Advisory Panel on Driving and Disorders of the Nervous System.

Dr. Philip Andrew Raffle, O.B.E., M.D., F.R.C.P., F.R.C.S., Chairman of the Medical Commission on Accident Prevention and late Chief Medical Officer, London Transport.

46. Dr. Taylor reported the Board's findings to me on 19th November 1985. These were that, on the balance of probabilities, the members of the Board believed that Driver Armstrong had suffered from an episode of amnesia and confused behaviour which had led him to ignore the signals at Caution and Danger. They considered that this was likely to have been due to a transient disturbance of blood flow in the posterior cerebral arteries. They remarked that episodes of amnesia from this cause are rare but well-recognised.

47. The Medical Board's full report is reproduced at Appendix 1.

Conclusions

48. I do not believe that it is possible to be fully certain as to the cause of the accident. I am satisfied that as the 17.54 Euston to Bletchley train approached Wembley Central the signals were set for the move of the Freightliner train from the Goods line onto the Down Slow line and that the signals on the Down Slow line protecting this move were showing the correct cautionary and stop aspects. I am further satisfied that the automatic warning system (AWS) associated with the signals and the corresponding equipment on the train was functioning correctly, and that adequate brake power was available to stop the train within the required braking distances. On his evidence, Driver Armstrong observed and reacted correctly to all signals between Euston and Signal WN211 but then failed to observe or to respond properly to the single yellow aspect displayed by Signal WN46 and the red aspect displayed by Signal WN27. Having cancelled the warnings given by the AWS at these two signals, but without taking any action to reduce speed, he passed the red signal at Danger before making a full emergency brake application some distance past the signal, by which time the Freightliner train would have been clearly visible on the line ahead. The train had been running at or near its normal line speed of 75 mile/h and the brake application reduced the speed to about 57 mile/h at the point of collision.

49. It is entirely possible that Driver Armstrong allowed his mind to wander or otherwise lost concentration, cancelled the AWS warnings, and continued to hold down the 'dead man's handle' without realising what he was doing. There have been other cases, rare but well documented, in which drivers running under repetitive cautionary signals (as when closely following another train) have similarly cancelled the AWS warnings and have passed signals at Danger. On the other hand, a distinguished panel of medical specialists, having examined Driver Armstrong and studied all the available evidence, have concluded that, on the balance of probabilities, Driver Armstrong's behaviour was due to a rare but well recognised medical condition. Bearing in mind the accuracy with which Driver Armstrong recalled the earlier part of the journey, and his long experience and excellent record as a driver, I believe he should be given the benefit of any doubt. The accident must therefore be attributed to a transient medical condition which prevented him from reacting as he should have done to the warnings given by the signals.

50. There remains the question of whether the Freightliner train should have been allowed out in front of the 17.54 passenger train. Mr. Peplar, in Willesden Signal Box, had a difficult decision to make but he had every right to regulate the traffic as he did. He gave adequate thought to the problem caused by the late running of the Freightliner train and his solution would have ensured that the Freightliner got away whilst causing no more than a few minutes delay to passenger trains. The signalling system is designed to allow him to make this kind of move. I have no criticism of his actions or those of Signalman Braithwaite.

Remarks and Recommendations

51. Acceptance of the fact that a transient medical condition led to the accident implies that the same thing could happen to other drivers, although the apparently rare nature of the condition means that the risk is not great. Consideration must therefore be given to finding ways of reducing even this risk. I have discussed the situation with Dr. Taylor who has confirmed that Dr. Earl and the Secretary of State's Medical Advisory Panel which he chairs would be glad to co-operate with Dr. Dickerson in any examination of ways in which the medical vetting of BR drivers might be altered or improved.

52. I have also discussed the implications of the Medical Board's findings with Dr. Dickerson and the Board's Director of Operations. Dr. Dickerson is currently re-examining the arrangements for the medical examination and vetting of drivers and, as part of this review, he has undertaken to discuss with Dr. Earl and the Medical Advisory Panel what practical steps might be taken to detect a tendency to transient disturbances of blood flow in the cerebral arteries such as may have led to this accident. So far as the age of drivers is concerned, the Inspectorate has no evidence to suggest that drivers in the 60 to 65 age group are any more likely than others to be involved in accidents. Dr. Dickerson is satisfied that provided regular and appropriate medical examinations are carried out, there is no reason why a driver should not continue to drive trains efficiently up to the age of 65.

53. As to the need for examination by railway medical officers of staff who have been absent from work for some time, Dr. Dickerson considers that criteria based solely on length of absence would be too rigid. One person might be away for several weeks with a complaint that had little or no bearing on his ability to drive whilst another could, for example, suffer something potentially serious such as a fainting episode and be absent for only a couple of days. Arrangements have already been made to ensure that the special forms regarding telephone advice on these matters are used at all BR medical centres. My own view is that whilst the present system, whereby Staff Clerks (to whom staff report after sick leave) seek medical advice whenever they consider it necessary irrespective of the length of absence, is obviously sensible it would be desirable to make the obtaining of medical advice mandatory after any absence exceeding, say, four weeks. In these circumstances it would be open to a medical officer to decide that

there was no need for him to see the person concerned but at least he would be aware that a member of staff had been off duty for this period.

54. Whilst I am not competent to recommend further on the medical steps that should be taken to prevent a recurrence I am confident that Dr. Dickerson will receive the full backing of the Board in taking such steps as he considers necessary to minimise the chances of a recurrence of this unfortunate accident. He has undertaken to keep the Inspectorate informed of the measures that are taken. I hope that other railway administrations will note the findings of this inquiry and will re-examine their own medical arrangements.

55. Finally, the fact that neither the automatic warning system (AWS) nor the driver's safety device (the 'deadman's handle') was able to prevent this accident has important implications for safety. It has been apparent for some time that, whilst AWS has proved a most important aid to drivers and has undoubtedly helped to reduce the number of collisions, it does not guard against incorrect cancellation of the kind that can arise when drivers are running under a sequence of cautionary signals – still less against 'unconscious' cancellation of the kind that apparently happened at Wembley Central. In the case of the DSD, vigilance devices can guard to some extent against the possibility that the DSD might be inadvertently held down when it should be released, but there must be sensible time intervals between demands that the vigilance device be acknowledged, and at Wembley the duration of Driver Armstrong's apparent incapacity was short. The Inspectorate was discussing with the Board, before the Wembley accident, the question of AWS and other aids to drivers and these discussions have continued. The Board is currently examining ways in which the present AWS might be made more effective, and is developing more advanced systems of information in the cab. The Inspectorate is being kept fully informed of these developments.

I have the honour to be,

Sir

Your obedient Servant

C. F. ROSE
Major

The Permanent Under Secretary of State
Department of Transport

Report of Medical Board convened on 17th September 1985

re: Accident at Wembley Central on 11th October 1984

Driver Ronald ARMSTRONG (25.07.21)

The Board first considered in some detail Mr. Ronald Armstrong's medical history before the occurrence of the accident on 11th October 1984.

Mr. Armstrong told us that for two or three years he had been subject to episodes of disturbed vision. These had occurred irregularly and without warning or any known precipitating factors. He estimated the frequency as perhaps three or four times a year. He said that the initial symptom of the attack was some sort of discomfort in the eye which he described as a sensation 'as if a stye was going to develop'. He would then notice coloured circles and visual blurring which were confined to the left side. He described this initially as affecting his left eye, but subsequent questioning seemed to indicate that it was a disturbance of the left homonymous field. The visual disturbance might last from 10 minutes to half an hour and he did not usually suffer with headache, but was often nauseated.

He said that he had never had an episode of this sort when driving a train and agreed that he had never thought to report these episodes at the time of routine medical examinations. He remembered experiencing such an episode on 10th October 1983 when driving his car and he stopped at the side of the road until he felt better.

Mr. Armstrong also described morning headaches which he said dated back many years and had been attributed by him to shift work. He said they often occurred after getting up. The headache was dull, never severe and was frontal in situation. It responded to two aspirins and a cup of tea. He ordinarily slept well but tended to wake in the early hours.

He said that he suffered from what he described as 'indigestion' which he treated himself with bicarbonate of soda. He attributed this to irregular meals over many years. He described the indigestion as a vague epigastric discomfort.

He remembered that from the age of 12 he had been subject to what he described as 'panic attacks'. These occurred at night when he woke from sleep with what he called a 'claustrophobic sensation'. He felt obliged to get up from bed and rush to an open window. He felt that he needed air and might even go out and walk in the street for some time to clear his symptoms. An episode of this sort had occurred this year.

In addition to this he described attacks of breathlessness associated with a sensation of panic occurring first about 10 years ago and following unusual exertion, such as digging in the garden. He said that he no longer had these episodes.

On 20th July 1984 he had an accident when he fell from the top of a ladder which he had put up into his loft. He was carrying down a heavy bag of dog food at the time. He remembers getting on to the ladder and next remembers finding himself on the floor. He does not know why he fell but the ladder was later found to be broken. His left side was bruised but he does not recall any bruising on his head. He suffered from severe pain in his chest and pain in his legs and his doctor thought that he had probably fractured some ribs. There was a large and painful haematoma over the outer side of his left thigh which spread to involve the whole of his lower limb. His doctor gave him some analgesic tablets which were not helpful and later changed his prescription. While taking the tablets prescribed on the second occasion he became irritable and during this time he made an error of judgement while driving his car and hit a kerb. He then stopped taking the tablets. He was away from work for nearly two months altogether and returned on 9th September and by then he had taken no medication for four or five weeks. Soon after he returned to work he developed a cold which forced him to stay in bed and he was away from work for another five days.

Mr. Armstrong also said that for about 18 months his sense of smell had been absent.

He denied any accidents or serious illness in the past and he said he was the youngest of a family of eight. He said that one sister suffered from episodes of blurred vision similar to those he had described, but there did not seem anything else of relevance in his family history. He was a heavy smoker and suffered from bronchitis until he stopped smoking about 15 years ago. He drinks about two pints of beer a month. After the accident he lost about four stones in weight which he has since regained.

Mr. Armstrong's account of the accident was as follows. He said that he remembered seeing a green signal at Willesden Junction when he was travelling at the normal speed, i.e. 70 miles/h. He then remembered passing under the bridges at Harlesden Station where he saw a double yellow signal and,

because that section of the line was straight, he saw a single yellow further ahead. When he passed the double yellow signal at Harlesden (Signal 211) the horn sounded in his cab and he remembered cancelling it. He also applied the brake very lightly (5–6 lb.). He said that this would not have been obvious to anyone travelling in the train. He said that he had no memory of events until he heard the horn sounding again as he passed the red signal at Wembley (Signal 27). He realised then that he was on a collision course. He said that driving this particular train he would usually be standing, leaning against the upturned seat, but he thought that he remembered getting up from the sitting position to the standing position as the horn sounded in his cab at Wembley. He said that he clearly remembered carrying out the safety procedures. He remembered being spoken to by a policewoman and was then taken to hospital (the Central Middlesex Hospital). He was examined and allowed to leave and returned to Harlesden Station. He got on a train to Euston and made his formal report to an Operating official and was then taken home to Leighton Buzzard by taxi. He said that when he got out of the train immediately after the accident his mind felt 'numb', but he was able to give the formal statement about the circumstances later the same evening at Euston.

EXAMINATION

The loss of smell, which he said he had noticed about 18 months ago, was confirmed. There was no apparent cause for this. His fundi were normal, as were the visual fields tested by confrontation. The other cranial nerves were normal. Power in his limbs was normal, the tendon reflexes were symmetrical and sensation was normal. His balance was very slightly impaired and he was not able to walk steadily heel/toe. There was some painful limitation of neck movement. His blood pressure was 150/80 taken on the right arm and the left. There were no bruits to be heard in the neck or over the precordium. No abnormalities were found on general examination.

The Board had available reports of electroencephalograms carried out at the Royal Free Hospital which were not quite normal and showed changes compatible with early cerebrovascular disease.

The Members of the Board felt that it would be wise to have further investigations carried out, viz radiographic studies of the cervical spine and of the main blood vessels in the neck. The x-rays of the spine showed minor degenerative changes and there no evidence of narrowing or occlusion of any of the main vessels in the neck.

CONCLUSION

The Members of the Board are of the opinion that Mr. Armstrong was a reliable and truthful witness. They have concluded that on the balance of probabilities he suffered from an episode of amnesia and confused behaviour which led him to ignore the signals at danger. The Board Members believe that this is likely to have been due to a transient disturbance of blood flow in the posterior cerebral arteries. Episodes of amnesia from this cause are rare but well-recognised.

The transient visual disturbances to which he had been subject are likely to be relevant and are probably due to a temporary disturbance of blood flow in the posterior cerebral artery on the right side leading to a disturbance of vision in the left half of the visual field.

Members of the Board: C. J. Earl, M.D. F.R.C.P.
M. J. Parsonage, M.D., F.R.C.P.
P. A. B. Raffle, O.B.E., M.D., F.R.C.P., F.R.C.S.

Signed on behalf of the Members of the Board:

C. J. Earl
(Chairman)

12th November 1985

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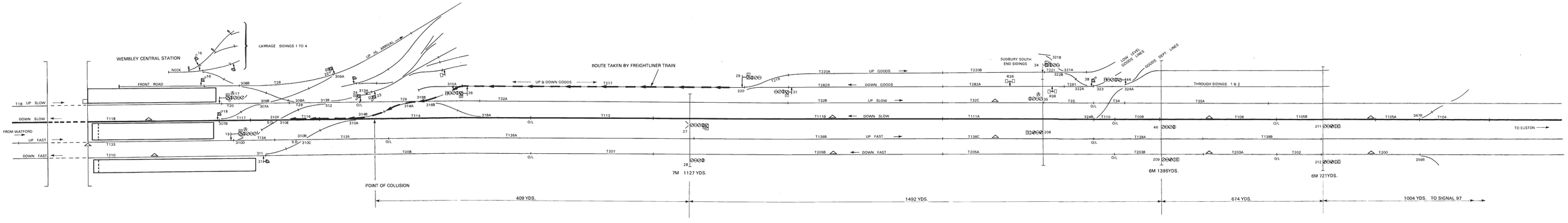
COLLISION AT WEMBLEY CENTRAL ON 11th OCTOBER 1984

DIAGRAM SHOWING THE SIGNALLING

NOT TO SCALE



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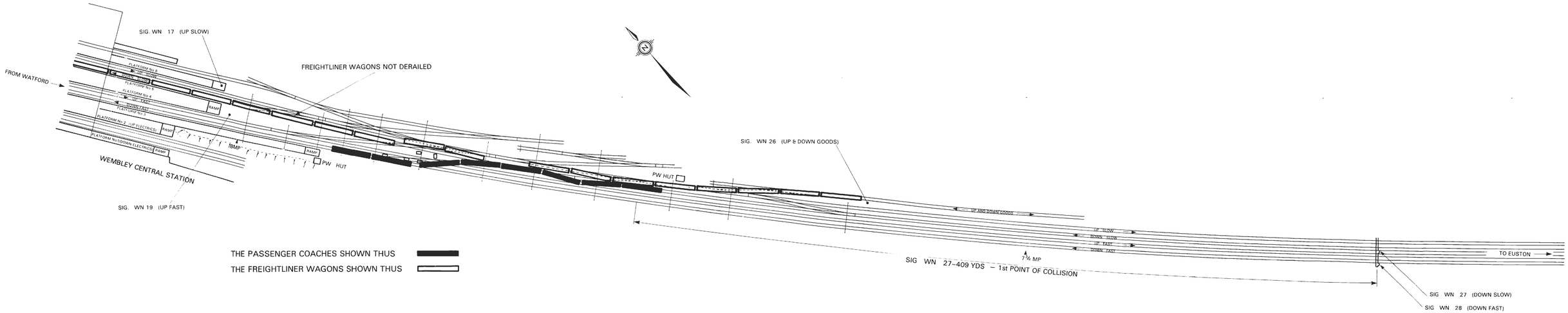
COLLISION AT WEMBLEY CENTRAL ON 11th OCTOBER 1984

PLAN SHOWING THE POSITION OF THE TRAINS AFTER THE COLLISION



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