DEPARTMENT OF TRANSPORT

RAILWAY ACCIDENT

Report on the Derailment that occurred on 11th September 1978 at Greenhill Lower Junction

IN THE
SCOTTISH REGION
BRITISH RAILWAYS

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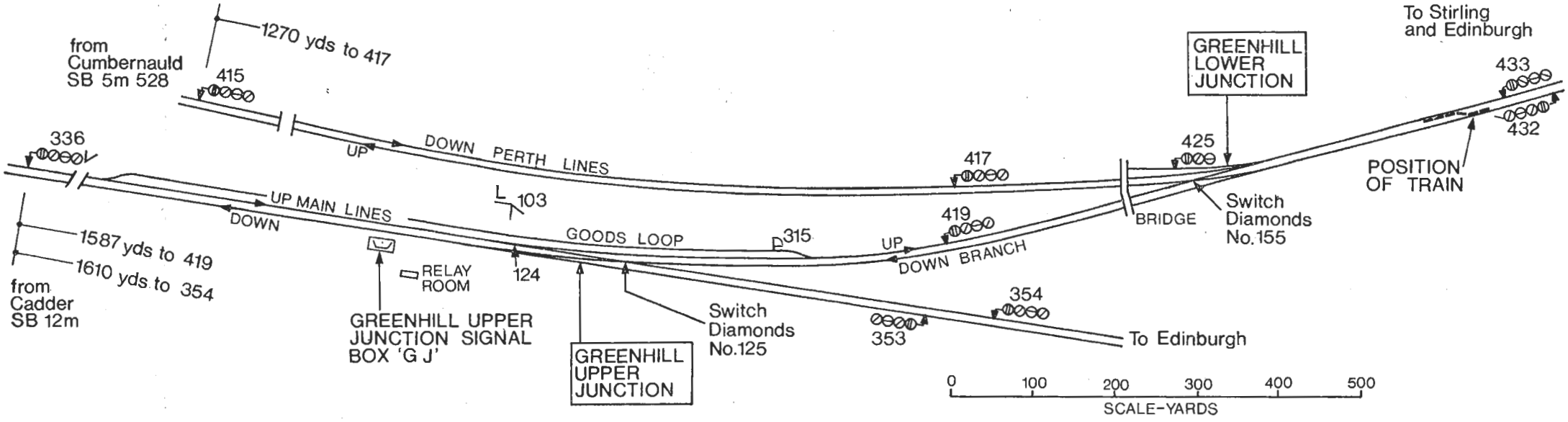
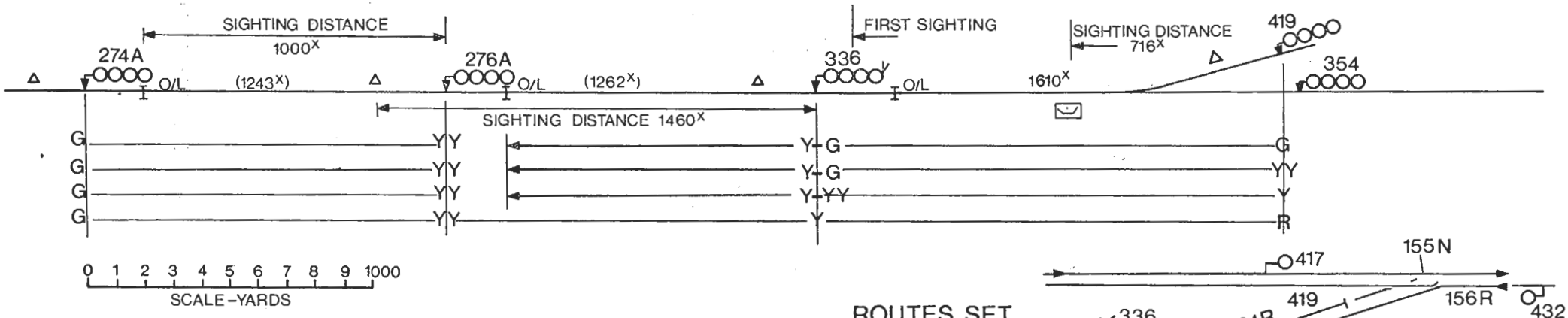
DERAILMENT 11 SEPT 78

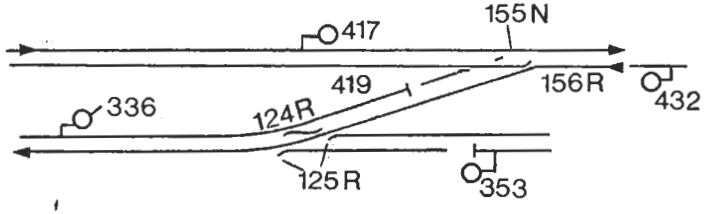
GREENHILL JUNCTIONS Fig 1.



APPROACH SIGNALLING Fig 2.



ROUTES SET Fig 3.



RAILWAY INSPECTORATE,
DEPARTMENT OF TRANSPORT,
2 MARSHAM STREET,
LONDON SW1.
16th July 1979.

SIR,

I have the honour to report for the information of the Secretary of State, in accordance with the Order dated 12th September 1978, the result of my Inquiry into the derailment of a passenger train on 11th September 1978 at Greenhill Lower Junction between Glasgow and Edinburgh in the Scottish Region of British Railways.

The train, the 07.14 diesel-multiple-unit from Glasgow, Queen Street, to Edinburgh (Waverley) via Falkirk Grahamston, was driven past a signal at Danger on the Branch line connecting the Main and Perth lines. The train was diverted onto the wrong line at the switch diamonds of Greenhill Lower Junction at a speed approaching 70 mile/h and became derailed blocking both lines, all six cars remaining upright.

After protecting all lines the signalman called the emergency services who arrived promptly. Fifteen passengers, the driver and the guard were taken to the Falkirk and District Royal Infirmary within 37 minutes of the call being received and all except the guard were discharged after being treated for shock or minor injuries. The guard, who suffered a back injury, was discharged on 20th September.

Damage to the rolling stock, permanent way and signalling equipment was extensive. The Down Perth and Up Branch lines were re-opened to traffic at 07.55 the following day but a normal train service could not be re-introduced until 15.32 on 13th September.

The weather at the time was dull and dry and visibility was good.

DESCRIPTION

The Site

1. Greenhill Upper Junction lies some 18 miles from Glasgow and 28 miles from Edinburgh on the Main Lines. The Perth lines via Cumbernauld to the south, pass under the Main lines west of the Junction and then run almost parallel to them, before turning away to the north via Larbert. At Greenhill, branch lines some 1000 yards in length, connect the Main lines at Greenhill Upper Junction to the Perth lines at Greenhill Lower Junction, as shown in figure 1 at the front of this report. A connection from the Perth lines via Falkirk Grahamston rejoins the Main lines by Polmont, and a proportion of Glasgow to Edinburgh trains take this route; the train involved in this accident was the first train in the day to do so.

2. It should be noted that the Main and Branch lines are Up towards Edinburgh but the parallel Perth lines are Up towards Cumbernauld and the south. The Branch lines curve left-handed in the Up direction at Radii of 1400 yards to 1500 yards throughout their length. In connection with resignalling in 1971 the Main line speed was raised to 90 mile/h, and 70 mile/h connections incorporating switch diamonds were laid at the two junctions. In the Up direction the Main lines approaching Greenhill Upper Junction rise to a summit about half a mile before the junction and then fall at 1 in 2772, but the Branch lines then fall at a gradient of 1 in 103 to the Lower junction. A road crosses the Perth and Branch lines 110 yards west of the switch diamonds at Greenhill Lower Junction by steel girder spans over the Perth lines and a brick arch over the Branch lines. There are several loop lines which, because they are of no concern in this accident, are not shown in the figures.

The Signalling

3. Signalling on the Main lines is under the Track-Circuit Block Regulations with three- and four-aspect colour-light signals controlled from Greenhill Upper Junction Signal Box. The previous signal box is at Cadder which is 12 miles distant, and track-circuit block extends to Polmont Signal Box. These regulations also apply from Cumbernauld on the Perth lines 5 miles 528 yards distant and extending to Carmuirs West Junction Signal Box. Standard British Railways AWS is provided at all running signals.

4. Both junctions are controlled from Greenhill Upper Junction Signal Box which stands beside the Down Main line with a relay room in a separate building behind it. GEC geographical route relay interlocking is employed and the signalman operates an entrance-exit type route setting panel with his back to the railway. The panel does not incorporate automatic train description equipment but trains are described on a separate instrument.

5. The signalling approaching Greenhill Upper Junction in the Up direction is illustrated in figure 2 which shows signal spacings and the aspects displayed when a route is set onto the Branch line. In accordance with the standard British Railways practice for a high-speed junction, the junction signal GJ336 is held at a single yellow aspect with a 'position 1' route indication for the branch until, if GJ419 on the Up Branch line is *NOT* at Danger, GJ336 is released to a YY or G aspect when a train occupies track circuit 322T at a point 1062 yards before the signal. At this point, the signal has already been in view for a distance of some 400 yards.

6. Signal GJ419 on the Up Branch line which protects Greenhill Lower Junction comes into continuous view from a point opposite the signal box; the sighting distance is 716 yards. It can however first be seen shortly after passing signal GJ336. Signal GJ354 on the Main line some 760 yards in advance of the signalbox can also be seen from it but is not clearly visible until the Upper Junction switch diamond points are reached when it becomes equally visible with Signal GJ419. Signal GJ425 on the North Goods Loop is also in view on the approach to GJ419 but because the signal head is turned away no aspects can be seen.

7. The signalman can set a route from Signal GJ336 to GJ419 to enable a train to wait on the Branch line clear of the Main line. He can also set a route from GJ419 to GJ433 on the Down Perth line. Once signal GJ419 has cleared for this route with switch diamonds and trailing points No. 155 reversed it is not possible to reset the points Normal until after the train has passed the signal or until 2 minutes have elapsed; it is of course possible to replace the signal to Danger at any time, but the route remains approach locked as described.

The Train

8. The 07.14 Glasgow to Edinburgh train via Falkirk Grahamston (2G20) consisted of two three-car diesel-multiple-units Nos. 180 (leading) and 222. Each consisted of gangwayed motor open cars marshalled outside a gangwayed trailer open car. The train was screw coupled, and the vacuum brake was fitted throughout. Of the four driving cabs, all but the leading cab were fitted with AWS equipment. The train was 364 feet long overall and weighed 178 tons, and its maximum permitted speed was 70 mile/h. Its braking effort was 75·4%. Had the train been braked from 70 mile/h as it passed Signal GJ336 it would have stopped in 1070 yards eg 517 yards short of Signal GJ419.

The Course of the Derailment and Accident Damage

9. The train was driven past signal GJ419 which has an overlap of 293 yards and approached the switch diamonds No. 155 which were set normal because the route was set for the Down Perth line from signal GJ417 to GJ433. The leading car ran through the right-hand blade of switch diamond No. 155A and was deflected violently by the closed left-hand blade of No. 155B down the Up Perth line, and then ran through the closed switch blade of Points No. 156. The train came to rest with its front 355 yards beyond the switch diamonds and with all bogies derailed except those on the leading car and the trailing bogie of the second car. The rear four cars were foul of both running lines but all cars remained virtually upright. The train also remained coupled except between the second and third cars where the coupling broke.

10. Damage to switch diamonds No. 155 was severe and one switch blade of points No. 156 was thrown out of the track into the cess where it struck and displaced a row of lineside signalling cabinets. Some 340 yards of plain line was also badly damaged. Three points machines were destroyed or damaged, four sets of point fittings and rods were damaged together with 500 yards of multi-core cable.

11. Damage to the train was mainly underfloor and became progressively worse towards the rear. Seven of the eight fuel tanks on the train were holed and a fire occurred on the rear car which was quickly put out. Heater fuel pipes were also severed on both trailer cars. Carden shafts were broken or split on the 3rd and 6th cars. Except on the leading car the brake rigging was generally damaged and the vacuum pipes on the rear three cars were severed. Inside the train two seats were displaced in the third car, seven in the fourth and eight in the sixth. Gangway ends were damaged on most of the cars and a buffer on the fourth car was almost torn off. But almost no glass in the train was broken.

EVIDENCE

12. *Relief Signalman L. Martin* took duty in Greenhill Upper Junction Signal Box at 07.00 on 11th September. He was well acquainted with it having worked in the area for some 13 years. He had the services of a signal box boy who maintained his train register. At about 07.20 the boy informed him that the 'motorail' train 1S15, which was running very late, was reported to have passed Gartsherrie on the Down Perth line some 10½ miles distant. At 07.26 the 07.14 train 2G20 was described on his train describer equipment from Cadder

Signal Box which is 12 miles distant, and at 07.35 1S15 was described from Cumbernauld Signal Box a little over 5 miles distant.

13. On hearing that 1S15 was passing Gartsherrie he had decided to pass that train first because it was a higher class of train and was already running about half an hour late. He therefore set the route for it along the Down Perth line and he set the route for 2G20 up to Signal GJ419 on the Up Branch line so that the Main line would be clear for traffic to pass behind it. He noted that Signal GJ419 was indicated on the signal box diagram as being at Danger. He had not set any route beyond the junction on the Main line and Signal GJ354 remained at Danger also. There were no flashing lights on the panel and he therefore assumed that points No. 155 at Greenhill Lower Junction were correctly set Normal for the Perth lines.

14. As 2G20 approached his box he had already set a route for the 07.17 Dunblane to Glasgow from the Up Perth line to pass over the Down Branch line onto the Down Main line. A fast passenger train from Glasgow to Edinburgh via Falkirk High following 2G20 had also been described to him from Cadder Signal Box, but it was well behind it. Shortly before 07.45, 2G20 passed his box at a speed that trains normally travelled at when running under clear signals and he straight away realised that it could not be stopped at Signal GJ419. He immediately replaced Signal GJ417 to Danger to stop the Motorail train which was then approaching the signal in rear, GJ415, from which it had a full braking distance. The 07.17 had already cleared Greenhill Lower Junction and the two trains passed each other on the Branch lines east of his signal box.

15. When the track circuits at the lower junction indicated 'occupied' he realised that a derailment had occurred and he sent the 'Train Running Away' bell code signal to Carmuirs West Junction Signal Box. He also replaced Signal GJ415 to Danger but by this time the Motorail train was at a stand at GJ417. The driver of the derailed train 2G20 then called him from a signal post telephone and, on being challenged, told him that the signals had been cleared for him.

16. Signalman Martin told me that it is quite a common practice to stop trains on the Branch lines. He had known of no other cases of signal GJ419 being passed at Danger but the ground position light signal at the exit of the Up Branch Goods Loop GJ315 had previously been passed at Danger.

17. *Traffic Supervisor A. H. Smith of Falkirk* heard about the accident while visiting Stirling Signal Box and arrived at the train at 08.10. He then went by car to the signal box and checked that the emergency services had been called and Control notified. He saw that all the track circuits at the lower junction were showing occupied, and the points indications were flashing 'out of correspondence' because the points were damaged. The train description from Cumbernauld for 1S15 was still recorded because the train had not passed Signal GJ417. That for 2G20 from Cadder had been automatically cancelled as the train passed Signal GJ336, but the signalman had not forwarded the description to Carmuirs West Junction Signal Box. There was no 'route strip' set up for either train. He reported that Signalman Martin was calm and collected and fit to carry on his duties.

18. *Senior Signalling and Telecommunications Technician J. McEwan* was working in the workshop beside the relay room when, at about 07.50, the signalman telephoned him and told him of the accident. He first visited the signal box and confirmed Traffic Supervisor Smith's evidence concerning the indications shown. He also noted that all the protecting signals had properly been replaced to Danger. He next visited the train, and helped to check that no passengers remained in it. He then inspected the switch diamonds No. 155. These had been set for the Perth lines but the 'A' end had been run through and the stretcher bar had been bent. There was clearly far too much damage for him to deal with, so he returned to the signal box where he suggested to the signalman that he lock the points of the Upper Junction Normal for the Main lines, which he later did.

19. Technician McEwan was present when the approach lock release timer on Signal GJ419 was tested and everything was found to be in order. He confirmed that had the signal been cleared and then replaced it would not be possible for the points to be moved to the Normal position for 2 minutes. Nor could the signal be cleared with the points in other than the Reversed position.

20. The driver of 1S15 was *Driver R. Abernethy of Perth.* He had taken over the train at Mossend Yard, where it was already running late. Although the line speed was 65 mile/h, his was a very heavy train of 19 vehicles and was travelling at about 40 mile/h when he saw the Distant Signal GJ415R at green. Signal GJ415 displayed a single yellow when he first saw it and he had no difficulty in stopping his train at GJ417 protecting Greenhill Lower Junction.

21. The driver of the 07.14 train 2G20 was *Driver R. Bowie of Eastfield.* He told me that he took over the train at Cowlairs and drove it into Glasgow, (Queen Strect), departing again at 07.14, on time. The train was running well and the brakes were good. Approaching Greenhill Upper Junction Signal Box he saw Signal GJ274 displaying a green aspect, and GJ276 a double yellow aspect.

22. When he first saw GJ336 it was displaying a single yellow aspect with a 'position 1' route indicator telling him that he was being (correctly) signalled onto the Branch line. He explained to me that as his train passed "two small yellow boxes beside the line" (Aster track-circuit location boxes) it was usual for the aspect of GJ336 to change to YY or G depending on the aspect of GJ419. He had often pointed this out to drivers whom he had instructed. At about this time on the day of the accident, he saw the other train approaching; he knew it was a Stirling train and he was friendly with a number of the Stirling drivers. As it passed he recognised Driver Jimmy Rew and they waved to each other. In spite of what the signalman had said he was sure that their two trains had passed to the west of the signalbox and probably between signals GJ276 and GJ336, and not "on the hill" of the branch line. He drove at 70 mile/h and it was not until he was passing under the bridge beyond Signal GJ419 that he saw that the points were set incorrectly for his train. He made an emergency brake application and hung on but he was thrown sideways when the train ran through the points, and hurt his shoulder. When his train came to a stand his first concern was for his passengers. Although he realised that his train was obstructing both lines he forgot to apply his track-circuit operating clips to either. He said that he had never used them nor had he been shown how to.

23. Driver Bowie was 59 years old and had driven on the line for 25 years having previously been a fireman on steam locomotives. He thought that the cab in which he was driving was the only one not fitted with AWS; he told me "you rely on the AWS horns quite a lot. You get used to getting the AWS". He was sure that, had he received an AWS horn approaching GJ336, he would have realised that the signal had not cleared from a yellow aspect and might have stopped his train safely at GJ419.

24. It was, he said, not a rare thing to be stopped at Signal GJ419 and his train was sometimes stopped at GJ336. He assured me that he was fit and not taking any drugs or tablets. He had worked a late shift from 16.30 on Saturday to 00.25 on Sunday morning but it only took him 15 minutes to drive home, and he slept well until 09.00, and he had a full rest day on the Sunday. At my inquiry I was told that in discussions with his depot manager it had been suggested that he may have had a personal problem but Driver Bowie was adament that he "hadn't a worry in the world." He also assured me that he had been sleeping well.

25. A passenger who had been sitting on the left-hand side of the leading car, *Mr James McGeeham of Kirkintilloch*, made the following statement:

> "The train made only one stop, that was at Croy Station. Approximately 10 minutes later the train branched off the Main line at Greenhill Junction. As the train was approaching an overhead bridge I saw the driver of my train waving to the driver of a train which was travelling towards Glasgow. Immediately afterwards I glanced out of the window and I think the signal at the overhead bridge was at red, but I cannot be positive."

Later, he said to a man in British Railways uniform whom he met at the lineside "The driver went through the red light" or words to that effect whereupon the man replied "No I didn't, I am the driver". Mr McGeeham admitted that he was slightly colour blind but claimed that he could easily recognise a red light. I treated his evidence as corroborative and did not ask him to submit to a colour test.

26. The guard of the train *Guard J. Boyle of Glasgow Queen Street* could add very little to his driver's evidence. He had not carried out a brake test at Queen Street because this was done before the train left Cowlairs, but he checked and found that the brake pressures were correct. He was sitting on the off-side of the fifth car when the train was diverted onto the Branch line. By its speed he assumed that all signals must have been displaying green aspects. In the derailment he was flung from his seat onto the floor and roughly bounced about on his back with one leg through the sliding door of the gangway. When the train came to a stand he was unable to move because of pain in his back. The driver visited his van and Boyle told him that he was too hurt to carry out his protection duties.

27. *Mr D. S. Jewell the Chief Signal and Telecommunications Engineer, Scottish Region* told me that the signalling had been fully tested after the accident and he was confident that it was in proper working order prior to it.

Conclusion

28. The fact that Driver Bowie's train was driven through switch diamonds No. 155 Reversed proves that he must have driven it past Signal GJ419 at Danger, and that it must have been at Danger for at least two minutes. At 70 mile/b the signal must have been at Danger when the train passed Signal GJ274. When I pointed this out to him Driver Bowie accepted that this must have been so.

Discussion

29. The error in driving his train was made as he approached the previous signal, GJ336. I believe he saw this signal displaying a yellow aspect with the junction indicator set for the branch line but from then on he failed to watch the signal and failed to realise that it had not cleared to a less restrictive aspect. It was a common experience that the signal normally cleared as the train occupied track-circuit 322T. This was easily recognised by drivers because of the two aster track-circuit containers beside the line. On this occasion he merely assumed that the signal had cleared when it had not done so. I believe that he had become accustomed to driving by the AWS bell or horn indications and allowed himself to be lured into a false sense of security when he did not have this facility. Driver Bowie believed that the accident would not have occurred if his train had been fitted with AWS.

30. Driver Bowie believed that it was because the other train was passing him that he had failed to look at Signal GJ336 but both the signalman and Mr McGeeham thought that the two trains had passed on the branch line, and I believe that this led to Driver Bowie failing to observe Signal GJ419 at Danger as he approached it—by which time it was in any case too late to stop his train safely.

On the Provision of AWS in Scottish Region

31. Of the 928 route miles in Scottish Region to be fitted with AWS, 580 route miles including most of the Main lines have so far been equipped. Not all the locomotives, or cabs of diesel and electrical multiple unit trains bave been fitted. It is necessary from time to time to transfer rolling stock from one Region to another and it so happens that trains fitted with AWS for use on a fitted line in one Region may be operated on an unfitted line in another. The type of brakes and the provision of lavatories are factors that affect the allocation of stock to routes. And it is not sensible to fit with AWS, stock that is approaching the end of its life.

32. There were in Scottish Region at the time of the accident, 23 DMU cabs not yet fitted with AWS equipment. In other regions there were many more. AWS is now in use for giving special warnings before certain temporary speed restrictions, and as a result instructions were given that no locomotive, DMU or EMU which was fitted with AWS equipment should be allowed to be taken into service unless that equipment was operating. This did not however apply to cabs not yet fitted with AWS. Instructions had been given that 15 of the 23 cabs should be fitted, and materials had been ordered. There have, however, been considerable delays in carrying out the work. I have discussed the situation with Officers of the British Railways Board who have agreed that all driving cabs in Scottish Region should be fitted with AWS by 1981.

On the Use of Track-Circuit Operating Clips

33. Once again I have to report a case of a driver who says that he has received no instruction in the use of the clips and had never applied a set to the rails, even in practice. This accident occurred on a section of line that was fully track-circuited and use of the clips would have assured Driver Bowie that the signals protecting the scene of the accident had been replaced to Danger. In the event he forgot about them although the damage caused by his train's derailment had replaced the signals automatically. Instructions had already been given that all drivers, when seen by their traction inspector once a year, should be practised in their use and I am satisfied that this should be sufficient reminder to drivers of their duty in their use.

I have the honour to be,

Sir,

Your obedient Servant,

A. G. Townsend-Rose,
Lieutenent Colonel.

The Permanent Secretary,
Department of Transport.

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