MINISTRY OF TRANSPORT

RAILWAY ACCIDENT

Report on the Derailment that occurred on 10th September 1963 between Longfield and Farningham Road

IN THE
SOUTHERN REGION
BRITISH RAILWAYS

LONDON: HER MAJESTY'S STATIONERY OFFICE
1964

ONE SHILLING NET

MINISTRY OF TRANSPORT,
ST. CHRISTOPHER HOUSE,
SOUTHWARK STREET,
LONDON, S.E.1.

24*th March* 1964.

SIR,

I have the honour to report for the information of the Minister of Transport, in accordance with the Order dated 18th September 1963, the result of my Inquiry into the derailment of a goods train that occurred at about 1.47 p.m. on the 10th September 1963, between Longfield and Farningham Road in the Southern Region, British Railways.

The 11.20 a.m. Up Dover Marine to Hither Green Continental Depot braked "ferry vans" train travelling at about 60 m.p.h. became derailed on curved track in a valley where a long and fairly steep falling gradient changes to an equally steep rising gradient. The derailment began at the second van and spread to the following 18 vans most of which were badly damaged before they came to a stand after having travelled about 185 yards beyond the point of derailment. The Down line was obstructed and the relevant signals on it were put to Danger when the track circuits were shunted by the derailed wagons, and the conductor rails were short-circuited cutting off power. The train parted between the first and second vans after the derailment but the brakes were not automatically applied as they should have been on the engine and it and the leading van travelled $1\frac{1}{4}$ miles before stopping under the driver's control.

There was extensive damage to the track as well as to the vehicles, and normal working was not resumed until 4.50 a.m. on the 13th September. In the meantime through services were diverted and an emergency bus service was provided for local passengers.

The day was fine and clear.

DESCRIPTION

The Site

1. The double track main line, electrified on the third rail system, which runs westwards in the Up direction from Dover to London via Strood Junction near MP 32 and Swanley near MP 17, rises steeply at about 1 in 100 for the last five miles to Sole Street near MP 27; it is then undulating for about two miles before falling steeply at about 1 in 100 for another two miles past Longfield Station at MP $23\frac{1}{4}$. The gradient eases on the approach to the valley where the derailment occurred, at about MP $22\frac{1}{2}$, whence the line rises again at 1 in 100 for about $\frac{1}{2}$ mile before falling once more to Farningham Road Station between MP 20 and 21. In the valley there is a trailing crossover between the Up and Down lines associated with a facing connection on the Down line for a single line branch northwards to Gravesend West.

2. Between Longfield and the point of derailment the track is an easy left-handed curve of $\frac{3}{4}$ mile radius for a short distance changing to a right-handed compound curve of radii varying between 66 and 82 chains shortly before the trailing crossover where the derailment occurred.

3. The permanent way in the Up line was of 95 lbs. bull head material up to the crossover which had been relaid with 110 lbs. flat bottom rails on new, wooden sleepers at the end of July. The re-laying had involved the complete crossover for both lines and, as is usual with such work, there were through timbers across both tracks over the area of the two trailing crossings. Ahead of the new crossover the permanent way was of 110 lbs. flat bottom track which had been laid shortly before the crossover was laid. During the relaying speed restrictions had been imposed as is usual but the final one of 40 m.p.h. had been removed on the 18th August. The authorised cant on the compound curve was $3\frac{3}{4}$ ins. reducing to 3 ins. through the crossover for a speed of 83 m.p.h.

4. The lines have continuous track circuits which, when occupied, control the appropriate colour light signals to Red. The Down line signal which was set to Red when the track circuits were shunted by the derailed wagons was Farningham Road No. 21, the signal for the junction to Gravesend West, just over $\frac{1}{4}$ mile from the crossover; A 162, an automatic signal about $1\frac{1}{4}$ miles on the approach side of No. 21, was turned to the yellow aspect when No. 21 turned to Red.

The Train

5. The train comprised 24 loaded continental ferry vans and a bogie brake van weighing approximately 618 tons drawn by Electric Locomotive No. E 5008 of 2,500 H.P. with a Bo-Bo wheel arrangement, and weighing 77 tons. This is a modern type of engine equipped with "run-up" gear on the power control camshaft in addition to the normal "notch-up". The driver is thus able to put the master controller in the "run-up" position and the control camshaft brings in the notches automatically, one at a time, while the controller is held in that position. There is also the "notch-up" position to which the controller is moved from the "hold" position when the driver wishes to increase power by one notch, and the "run-back" and "off" positions on the other side of the "hold" position for reducing power. A notch indicator gauge is provided on the right hand side of the other gauges in front of the driver and it shows the notch in which the engine is working. There are 33 notches. The engine is fitted with the compressed air brake, with air connections for working air braked trains, and with exhauster equipment and a vacuum train pipe for working vacuum braked trains. With this dual brake equipment the control system for the air brake is linked by an air-vacuum relay valve to the vacuum pipe so that when the engine is working a vacuum braked train both the engine and train brakes are controlled proportionately by the one brake handle. An independent straight air brake with separate brake valves is also provided together with the usual deadman's equipment.

6. Of the ferry vans which were loaded with fresh fruit, 19 were of 14 ft. 9 ins. wheelbase and 5 of 19 ft. 9 ins. wheelbase; all were screw coupled. Most of them were refrigerator vans with a tare weight of $15\frac{1}{2}$ to $16\frac{1}{4}$ tons, but the third and seventeenth to twenty-first were of lighter construction with a tare weight of $12\frac{1}{2}$ to $13\frac{1}{2}$ tons. All were fitted with compressed air brakes for use on the Continent, and nineteen with the vacuum brake. The bogie brake van was equipped with the vacuum brake only. The vacuum brake system was connected throughout the train, but only operative on 17 of the ferry vans as the brake system on two of them had been put out of use.

The Course of Derailment and Damage

7. The first mark of a wheel starting to climb the high rail, on the cess side, was found $14\frac{1}{2}$ feet beyond the nose of the trailing crossover, the diagonal line caused by the flange of the derailed wheel extending thence for $24\frac{1}{2}$ feet to the outer edge of the rail. Beyond this point the track was damaged, lightly at first, but severely in the area where the derailed vans lay. In all 160 yards of 95 lbs. track and conductor rail were destroyed on the Up line and 40 yards of 110 lbs. track and 20 yards of conductor rail in the Down line.

8. As already mentioned the train parted behind the leading van and the second to twentieth vans were derailed. Of these the first fifteen were deflected and most of them were capsized, some across the Down line, but the greater number on the Up line or away from the line over the Up cess. The next four vans remained upright and in line though derailed and the last four and the brake van were on the rails. The leading derailed van came to rest about 185 yards ahead of the point where the wheel started to climb. It was turned onto its side to the left of the track, broadside to the direction of travel, and was crushed by the van behind it. This and the three vans behind it had also turned across the direction of travel and each was jammed against the one in front. One axle of the leading derailed van was found separated from it, but both axles were almost new and in good condition, with unworn wheel profiles. The measurements of axle box clearances on this van were similar to those of other fruit vans varying from half inch to eleven-sixteenths inch. The van had been coupled ahead by the coupling of the first van which travelled on with the engine. The coupling was not damaged and had evidently jumped off the hook after derailment; when measured the length of the coupling matched the lengths of the buffers of the two vans which therefore would have been just in contact when the train was coupled. No significant damage was found on the gear of the wagon which could not be attributed to the results of the accident.

Evidence

9. The evidence did not disclose any clear reason for this derailment in that no material fault could be found in the condition of the wagon: no serious fault was found in the track though there were minor variations from level: and no evidence was found of excessive speed or mis-management.

10. *Driver A. A. Richardson* of the ferry vans train said that the guard had told him that 17 of the 24 vans were braked, the load was equivalent to 480 tons, and that the speed was not to exceed 60 m.p.h. (This was the speed limit permissible on the date of the accident for fast running freight trains with not less than 50% braked vehicles). He was familiar with the handling of perishable fruit through goods trains, mostly consisting of refrigerator vans, which run periodically from the Continent. His engine was coupled to the train at 12.10 p.m. and he left Dover at 12.23 p.m. after a satisfactory brake test.

11. Richardson described the run in some detail and the speed at various points where he varied his control of the train throughout the journey. He said that he stopped momentarily in Chatham platform at the starting signal at Red and thereafter had a clear run. After a slow start to observe the 25 m.p.h. speed restriction over Strood Viaduct (the restriction is 30 m.p.h.) he travelled up the incline to Sole Street with the controller in notch 27, passing Sole Street at 40 m.p.h. where he reduced power to notch 14. The speed gradually rose on the falling gradient and he said that it was 58 m.p.h. passing Longfield station. He saw platelayers near the crossover at the foot of the hill but ran on unchecked up the rising gradient on the far side until he noted an undue slackening of speed. He looked at his instruments and saw the vacuum pipe gauge at zero and the cylinder air pressure gauge at zero and the power indicator light out. He told the second man who put his head out of the window on the off side to look back along the train and reported that only one van was attached. Richardson immediately applied the air brake on the engine by working the combination brake handle, obtaining 60 lbs. pressure on the gauge. He said that the brakes became applied quickly but he was surprised that they had not become applied automatically by the breakaway.

12. Richardson sent the second man towards Farningham Road to protect the down line and to report the accident, and walked back himself along the Up line until he met the guard of a Down passenger train which he had passed after the breakaway and which had been stopped at No. 21 signal; this had been put to Red by the vans derailed across the Down line. Richardson then returned to his engine, placed the short-circuiting bar on the track and "paddled up" the collector shoes of the engine while waiting for relief. He agreed that his engine travelled about a mile after the breakaway before he looked at his gauges, but he said that there was no special reason for him to look at them during this time of about a minute; he had felt no jerk when the train parted and only began to realise things were out of course when his engine lost speed. Insofar as the speed on the journey was concerned Richardson was adamant that when he had last looked at his speedometer at Longfield station it was reading 58 m.p.h.

13. *Fireman K. J. Fillbrook* was Driver Richardson's second man. He confirmed his evidence with only minor discrepancies except that he said that the controller was moved back to notch 16 at Sole Street whereas Richardson had said notch 14. He noticed the loss of vacuum at about the same time as his driver and confirmed that he had not previously felt a surge or check. After the engine had stopped he went along the Down line with detonators to the first signal on that line where he reported to the signalman and put down detonators.

14. *Goods Guard G. F. Newsham* had a clear recollection of the details of the trip. He said that he had often worked with Richardson who was in his opinion a very steady driver. He began to look round the train $1\frac{1}{4}$ hours before it left and checked all the wagons to make sure that none were of less than 10 ft. wheelbase and that all were marked S or SS which indicate fitness to run at 100 and 120 km ($62\frac{1}{2}$ and 75 m) per hour respectively. After obtaining details of the load from the carriage and wagon examiner he advised the driver that the load was 480 tons plus a 25 ton bogie brake van. He said that he allowed 20 tons for each loaded ferry van.

15. Guard Newsham continued his evidence to the effect that the train had saved 2 minutes on the scheduled time when passing Sole Street at 1.42 p.m. and so far as he was aware they were travelling at the normal speed thereafter when he felt a surge followed by loss of vacuum. He got out of his seat to find out what was happening but was thrown to the floor and stunned for a moment by the sudden stop. As soon as he picked himself up, he looked at his watch and checked the time to be 1.48 p.m. He thought that he did this very soon after the train had stopped as his bag which was hanging on a hook was still swinging. Newsham got down to protect the line but platelayers at the site did it for him. When he inspected the train he found his van and the four vehicles ahead of it on the rails, four ahead of these were upright but derailed and the ones in front were spread in a tangle across both tracks.

16. It was put to Guard Newsham that the method used by him for assessing the load was no longer the correct one and that the train was appreciably overloaded. The system had been changed in June 1963 and in accordance with the new calculations seven of the 24 vans should have been removed from the train. Newsham agreed that he had failed to follow the new system and had used the former method of load assessment which had been in force for a number of years before June. He was positive about the accuracy of his times recorded at Sole Street and after the accident. It would seem therefore that six minutes elapsed while the train travelled the $4\frac{1}{2}$ miles from Sole Street to where it stopped and while Newsham regained consciousness. This, after making due allowance for time spent on stopping and in Newsham recovering, suggests that the speed at derailment cannot have been much in excess of 60 m.p.h.

17. *Driver R. L. J. Collins* and *Guard L. P. Linkin* of the electric multiple-unit passenger train which ran a few minutes ahead of the ferry vans train both said that their train travelled over the length where the derailment occurred at the normal speed of 60-65 m.p.h. and that they noticed no unusual movement. Collins added that he would have made a note of any such movement and would have reported it.

18. The evidence of times given by *Signalmen W. J. Wraight* of Strood Junction box and *A. R. Parkin* of Swanley box confirmed the estimates of speed given by the train crew and deduced from the guard's recorded times. The time of the accident as recorded in Swanley Electric Control Room when the circuit breakers opened was 1.47 p.m., one minute earlier than that recorded by the guard. Even if this meant that he had taken one minute to recover the train had still taken five minutes after passing Sole Street to travel the $4\frac{1}{2}$ miles to the point of derailment.

19. The platelayers seen by Driver Richardson at the site of the derailment were engaged in the final packing and alignment of the crossover. *Ganger F. J. Gilliam* said that his men had prepared the long timbers of the crossover for packing during the morning and had made a lift of about $\frac{3}{8}$ in. in the Up line before stopping for dinner. Afterwards he and his men had "run out" the lift on this line and were removing their equipment to the Down line when the train before the ferry vans train passed on the Up line at about 1.35 p.m. at normal speed. Gilliam said that he thought that the ferry vans train approached at a speed of between 65 and 70 m.p.h.; after the front of the train had passed over the crossover he saw a van take a plunge and then the general derailment occurred. He was quite sure that no tools had been left in the track which might have interfered with the train, and he accounted for all his tools afterwards. After the accident he arranged for protection.

20. A careful check of the track was made with cross levels measured at 5 ft. intervals extending back from the point of derailment for 300 ft. This showed only minor discrepancies in gauge, level, cross level and alignment, the main significant variations being that the cant was in excess by $\frac{1}{2}$ in. at 130 ft. from the point of derailment, $\frac{1}{2}$ in. deficient at 70 ft., in excess by $\frac{3}{8}$ in. from 40-15 ft. and correct at the point of derailment. These variations, though they could encourage oscillation or hunting, were not of themselves serious.

21. *Carriage and Wagon Examiners L. G. Garrad* and *E. G. Morris* described in some detail how they had examined the train at Dover Marine before departure. Garrad examined the brake equipment and Morris made the general examination of springs, axle boxes, wheels, draw-gear, buffers and so on. Garrad said that he had to blank off the cylinders on two wagons on which the vacuum brake was not working and he noted that five others were vacuum piped but not braked. Morris said that he had found nothing wrong with the general condition of any of the vans; he was not unduly hurried in his examination.

Running Tests

22. The evidence as to the speed of the train was not conclusive. A small variation from the recorded time for the last $4\frac{1}{2}$ miles from Sole Street to the point of the accident, coupled with different assumptions as to the rates of retardation and acceleration could affect materially the estimate of speed at derailment. I therefore asked for a number of tests to be made with trains of similar composition using the power settings quoted by the driver and by the second man. Only one of four such tests indicated that the speed would have been higher than 60 m.p.h. at the point of derailment. This was the first test made before the track had been fully refettled, and it was necessary to reduce speed before reaching the scene.

Authorised Speed of Train

23. There seemed some uncertainty about the authorised speed of the train and I asked Mr. G. F. Huskisson, the Line Manager, to outline the position. He has advised me that before June 1962 ferry vans trains were treated as parcels trains with a permitted speed of 75 m.p.h. The speed was reduced then to 60 m.p.h. At the time of the accident, therefore the ferry vans train was authorised to run at 60 m.p.h. provided that 50% of the train was braked. The fact that the train was oversize did not affect its safe running; the load limitation is imposed with respect to the power of the locomotive, the timing of the train, and the gradients. Shortly after the date of the accident the maximum speed of ferry vans trains was limited to 50 m.p.h.

24. Though not contributing to the derailment in any way, the failure of the engine brake to become applied automatically is contrary to the Regulation of Railways Act of 1889. I therefore asked Mr. W. J. A. Sykes, the Chief Mechanical and Electrical Engineer, Southern Region, how the failure came about and what steps were being taken to prevent a recurrence. His description of the circumstances which led to the failure and of the steps which have been taken to overcome them is given at Appendix A. It will be noted that a very unusual set of conditions was necessary to isolate the air brake of the engine from the vacuum control system when the derailment occurred.

Conclusions and Remarks

25. As I have said there was no clear reason for this derailment. The train was seriously oversize in accordance with current instructions, but trains of this size had been running in this service before the revised instructions were issued in June 1963. The speed may have been a little higher than 60 m.p.h., but this speed is not critically significant since the authorised speed for this class of train had been 75 m.p.h. for many years. The inequalities in the track were minor in character and there was no evidence that the maintenance was at fault. The condition of the wagon when it first became derailed could not be clearly established owing to the damage it suffered, but it seemed to have been in order. There is however some lateral play between the bodies and axles of the ferry vans which would allow oscillation to take place if the train was not under traction or buffing. This is the condition which would have applied to the train at the foot of the incline with the power regulator a little open, and I can only assume that the wagons were travelling in the loosest condition and that the variations in cant helped an oscillation to develop which caused the van to become derailed. It is of interest to note that a derailment in June 1962 on the Down line close to the site of this derailment, and another of an empty ferry van on the Down line between Borough Green and Wrotham in September 1962, both at high speed, also occurred at the foot of long falling gradients.

26. The restriction in speed of 50 m.p.h. applied after the accident to ferry vans trains is in accordance with a general restriction applied by the Railways Board. I understand that in April 1963 a restriction of 50 m.p.h. was imposed on all vehicles with a wheelbase of 10 ft. or less, and that from 21st September 1963 this instruction was also applied to fast running freight trains (Class 4 and Class 4+) except a few, specially authorised, which may travel at 55 m.p.h. or 60 m.p.h., according to class. Special authorisation has not been asked for ferry vans trains which are in these classes though they are composed of long wheelbase vans, and they therefore run at not more than 50 m.p.h. I understand that the restrictions applied by the Railways Board in respect of short wheelbase wagons are to remain until further investigations into the running of 4-wheel wagons have been completed.

27. I have no doubt that the steps which Mr. Sykes has put in hand to overcome the failure of the engine brake to become applied automatically will be successful for both types of locomotive, and that due note of the problem, if appropriate, will be taken in the other Regions of British Railways.

28. The guard was at fault in not assessing the load of the train properly, but as Mr. Huskisson explained the instructions were not altogether clear, and I understand that they have since been amplified.

I have the honour to be,

Sir,

Your obedient Servant,

The Secretary,
Ministry of Transport,

W. P. REED,
Colonel.

APPENDIX A

Failure of Engine Brake to become applied automatically after the parting of the train following the derailment near Longfield on 10th September 1963.

In a line with standard B.R. Practice for non-steam locomotives the 24 Bo-Bo 2500 h.p. electric locomotives built for the Southern are equipped with air brakes. To conform fully to the particular requirements of the Region trains equipped with both automatic air or vacuum brakes can be operated and to this end the basic brake system of the locomotive is an automatic air brake, but both air and vacuum train pipes are provided. Control of train vacuum brakes is effected by the driver's brake valve but an air-vacuum relay valve makes the requisite adjustments to the vacuum train pipe pressure while the locomotive brakes are applied through the same triple valve as when working an automatic air-braked train, but now under vacuum control. An independent straight air brake with separate brake valves is also provided together with the usual deadman's equipment.

The selection of air or vacuum control of the triple valve is made by a valve called the Air-Vacuum Isolating Valve whose function is to bring into play the air or vacuum control diaphragms of the triple valve. This valve is biassed to air control and changes to vacuum control merely on the creation of a fairly low vacuum on switching in the exhausters. Two exhausters are provided; one, fed from the line supply and connected electrically across the motor of the main booster-generator set, runs continuously for maintaining vacuum. The other is battery-fed and is provided to assist the "line" exhauster for brake releasing and to maintain vacuum in the inevitable breaks of conductor rail supply when it cuts in and out automatically according to the voltage available. The air-vacuum isolating valve is situated as close to the "line" exhauster as possible to keep the piping between the two short.

Normally the "battery" exhauster will only cut in when the locomotive runs through a fairly long conductor rail gap when the speed of the booster-generator set has been reduced to a value where insufficient voltage is generated to drive the "line" exhauster at a speed high enough to maintain the required train pipe vacuum. When cut in it will gain speed after a few seconds and this is normally sufficient to prevent a significant drop in train pipe vacuum.

Under the conditions created by the Longfield derailment, however, the line supply was actually short-circuited and the locomotive protective equipment operated removing the excitation of the booster set. In the circumstances the "line" exhauster stopped almost immediately, and as the vacuum train pipe was ruptured the vacuum fell to zero before the "battery" exhauster could even start up, with the result that the air-vacuum isolating valve reverted to the air-braked condition so that the locomotive brakes did not respond to the loss of vacuum in the vacuum train pipe.

The modification which it has been agreed will be necessary to overcome the combination of circumstances mentioned above consists of the addition of a magnet valve to the air-vacuum isolating valve. This valve will be so connected that it is energised when the exhauster switch is at "off", i.e. the air-braked condition, and de-energised when the exhauster switch is at "on", i.e. the vacuum-braked condition. When de-energised it would cause "control" vacuum—which, once created, does not fall from 21 ins. h.g. until vacuum working is relinquished—to act on the air-vacuum isolating valve diaphragm so preventing this valve from changing over due to the loss of an exhauster from whatever cause. Preliminary tests have indicated no change in the vacuum "locked in" some 30 minutes after the simulation of a failed exhauster. It will be seen that there will be a failure to safety in the event of loss of supply to the E.P. valve as, apart from venting the vacuum control side of the diaphragm on switching off the exhauster, it plays no further part when air-braked.

Similar brake equipment is used on the 98 Bo-Bo 1550 h.p. diesel-electric locomotives operating on this Region but with the exhauster operated from the battery and it will be appreciated that for a similar failure to arise it is necessary for an exhauster or its supply to fail at the same instant as the vacuum train pipe starts. The possibilities of this are much more remote but nevertheless still exist and a similar modification will be made to these locomotives. The investigations which have been carried out have indicated another weakness with the particular arrangement of brake components on these diesel-electric locomotives. It has been found that it is possible for the brake to mal-function under circumstances in which parting of the vacuum train pipe very close to the locomotive occurs. In these circumstances the train pipe vacuum falls rapidly to zero and the pressure gradient existing between the exhauster connection to the air vacuum isolating valve and the open end of the pipe is such that the vacuum on the isolating valve diaphragm may fall to the changeover value. It is now suspected that this in fact occurred on one of these locomotives following a derailment in March 1963; the weakness is of course overcome by the modification mentioned above.

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