



Rail Accident Investigation Branch

Rail Accident Report



Station over-run at Haywards Heath 12 January 2006

Department for
Transport

Report 10/2006
July 2006

This investigation was carried out in accordance with:

- the Railway Safety Directive 2004/49/EC;
- the Railways and Transport Safety Act 2003; and
- the Railways (Accident Investigation and Reporting) Regulations 2005.

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Introduction

- 1 The sole purpose of a Rail Accident Investigation Branch (RAIB) investigation is to prevent future accidents and incidents and improve railway safety.
- 2 The RAIB does not establish blame, liability or carry out prosecutions.
- 3 Access was freely given by Southern and Thameslink Train Operating Companies to staff, data and records.
- 4 Appendices at the rear of this report contain Glossaries explaining the following:
 - acronyms and abbreviations are explained at Appendix A; and
 - certain technical terms (shown in italics the first time they appear in this report) are explained at Appendix B.

Summary

- 5 On 12 January 2006, the 02:40 hrs Bedford – Brighton made up of 2 class 319 electric *multiple units* over ran Haywards Heath station by some 4 vehicle lengths.
- 6 The cause was established as a brake defect arising from a detached washer creating an electrical connection between brake control wires on the leading unit.
- 7 It has not been possible to establish the origin of the washer.
- 8 Two recommendations are made to improve safety, which are found at paragraph 37.

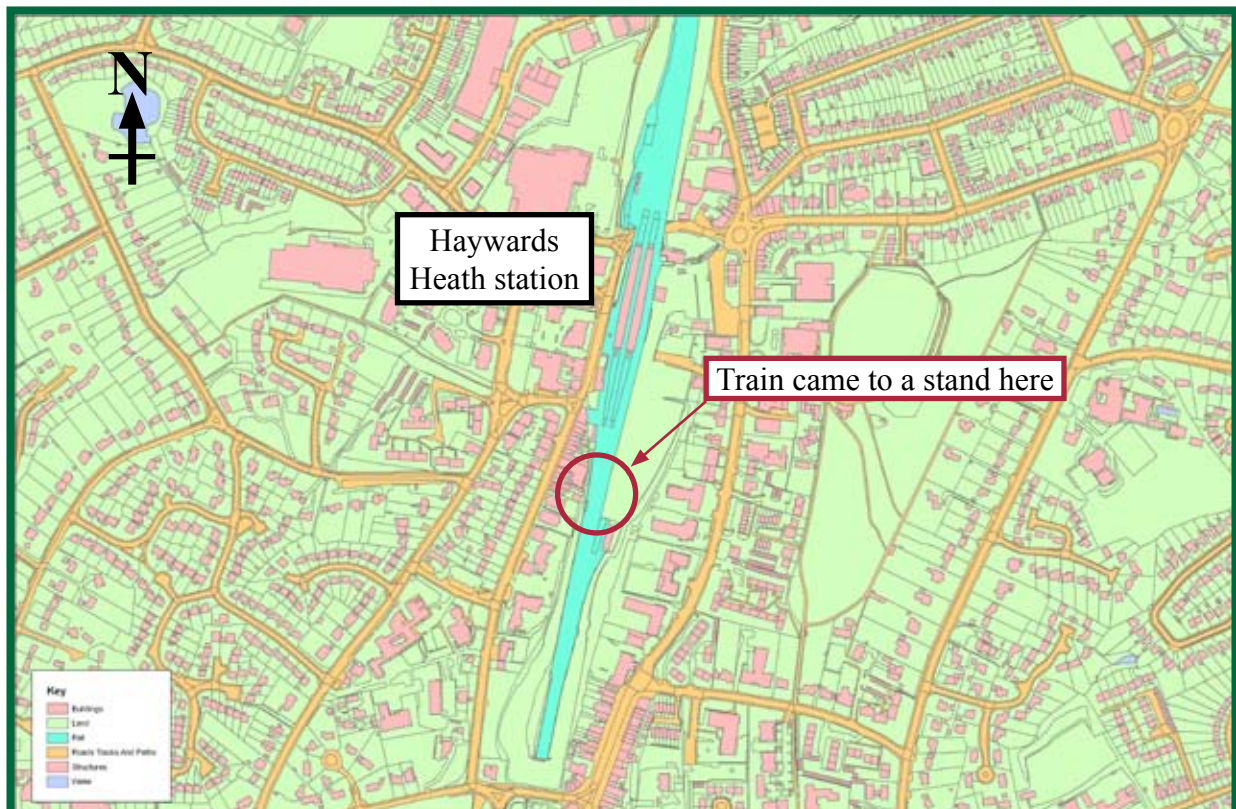


Figure 1: Extract from Ordnance Survey map showing location of incident.

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The Investigation

Summary of the incident

- 9 On 12 January 2006 the driver of the 02:40 hrs Bedford – Brighton, made up of class 319 units (319004 leading 319432), experienced difficulties when braking for the scheduled stop at Haywards Heath at about 05:25 hrs. The train over ran the station by approximately 4 vehicle lengths. With authority from the signaller at Three Bridges, the train was set back into Haywards Heath station driving from the north end cab. Similar braking difficulties were experienced during this move. The journey had been uneventful until the approach to Haywards Heath.
- 10 The train was terminated at Haywards Heath.
- 11 A member of the Southern TOC rolling stock maintenance staff with appropriate knowledge of the class 319 attended and was able to isolate, but not rectify, the fault by operating the *Electrical Bypass Switches* at each end of the train.
- 12 This enabled the brakes to be applied correctly by the driver throughout the train. In this configuration electrical train wire detection of the complete continuity of the train by the brake equipment is not provided. An effect of this is that if the train becomes divided the trailing portion will be brought to a stand by the automatic operation of the brakes but no indication will be given to the driver of the train division. Apart from this the brakes will operate normally.
- 13 The complete train was moved empty at caution to Lovers Walk Depot, Brighton for investigation accompanied by the member of Southern TOC maintenance staff, who periodically monitored that the train had not become divided in accordance with the operating instructions for class 319 units.

Events following the incident

- 14 The fault was traced to the presence of an extraneous 6 mm washer in the *drumswitch* adjacent to the coupler on vehicle 77297 of unit 319004 in the centre of the train. The washer was causing a short circuit, and therefore a false feed, between two wires operating the brakes.
- 15 Figure 2 shows the drumswitch with a cover removed to reveal the terminals where the washer was found.
- 16 Class 319 units have a brake with 4 positions, Steps 1 – 3 and Emergency, Step 1 providing the lowest braking rate.
- 17 The false feed caused by the washer was such that when the brake controller was placed in either Step 2 or 3 positions no brake application occurred. Step 1 and Emergency brake positions worked satisfactorily. The brakes worked correctly immediately the washer was removed. Their operation was confirmed by a functional brake test.
- 18 A more detailed description of the operation of the brakes and the nature of the fault are given below in the Analysis.
- 19 A Full Brake Investigation subsequently took place at Cauldwell Walk Depot, Bedford on 13 January 2006 and revealed no other relevant fault.

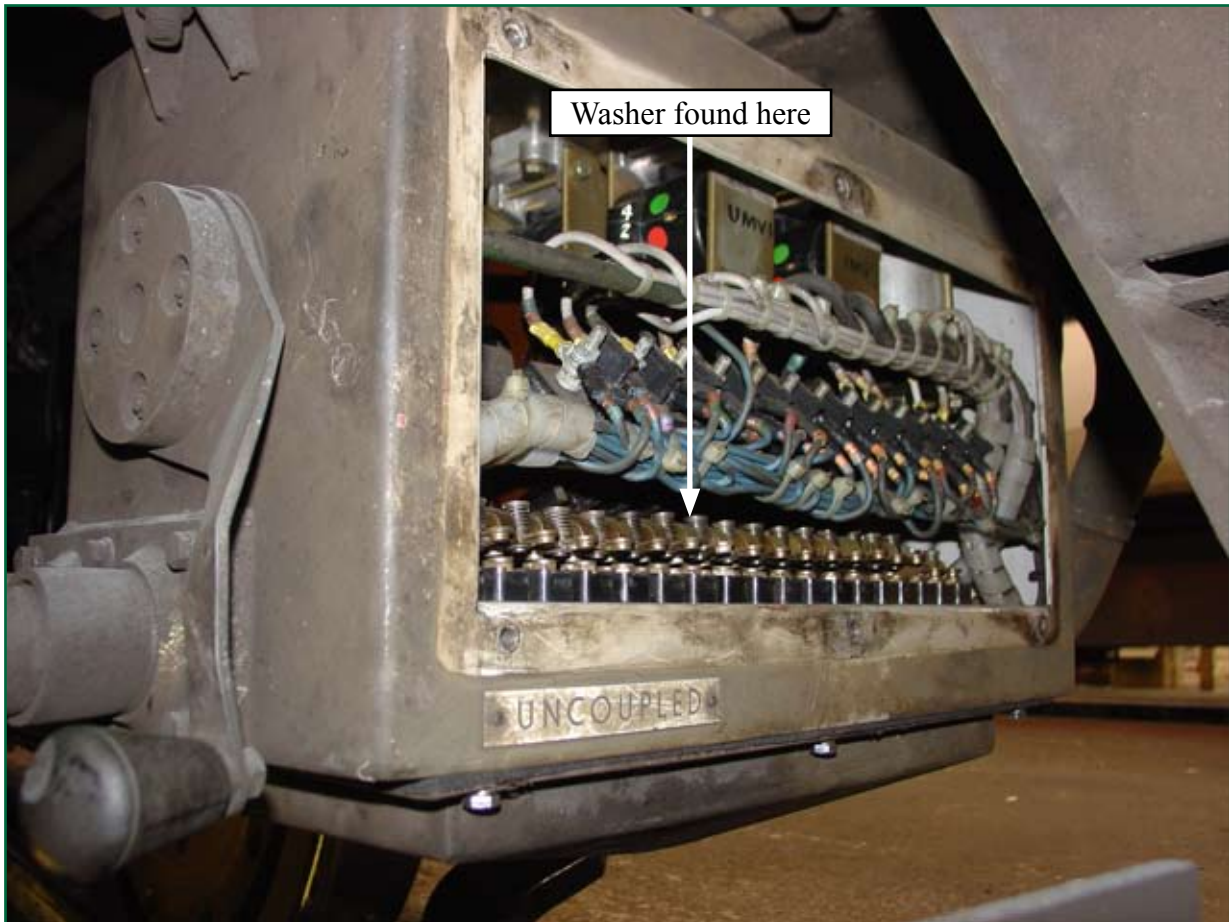


Figure 2: Class 319 drumswitch with cover removed showing terminals where the washer was found

Analysis

- 20 The origin of the washer is not known. It is likely that it had been loose in the drumswitch and became dislodged from its resting place by the movement of the train, falling onto the terminals of the wires concerned. It is possible that it may have been originally part of the securing assembly for a pair of valves in the upper part of the drumswitch.
- 21 Maintenance procedures call for the drumswitch to be examined internally at maintenance examinations every 80,000 miles. The unit was released from such an examination on 2 January 2006, six days before the incident. There is no record of the drumswitch receiving attention during those six days.
- 22 The rear and bottom sections of the drumswitch are reasonably accessible. Examination of the front section, where the washer was found, is severely hindered by the presence of the obstacle deflector and, unless a mirror is used, only an oblique view can be obtained. The view shown in Figure 2 was obtained by placing the camera in a position adjacent to the coupler which cannot be reached by the naked eye.
- 23 The maintenance instructions have been altered to require the use of a mirror where a direct line of sight cannot be obtained (Recommendation 1).
- 24 The maintenance records do not show any 'out of course' attention to the drumswitch on vehicle 77297 in the 12 months before the incident. However, the unit underwent classified attention at Alstom's Wolverton Works in August 2005. During that attention the drumswitches were opened to change the magnet valves.

- 25 During a drumswitch examination on 2 February 2006 a 6 mm flat washer was found in the drumswitch of unit 319430, vehicle 77348. Again, its origin is not known, but the unit was undergoing examination immediately after return from attention at Wolverton that had included the replacement of the drumswitch magnet valves
- 26 The findings of this report should be specifically taken into account by Alstom in their Quality Control of work during maintenance or repair (Recommendation 2).

Class 319: operation of the brakes

- 27 Class 319 trains are equipped with an electrically controlled brake which avoids the need for a continuous air brake pipe running the length of the train. This is replaced by an electrical control connection known as ‘13 wire’.
- 28 In normal running 13 wire is fed from the rear driving vehicle as soon as the *master switch* in the leading cab is moved away from ‘off’. It enables 10 and 11 wires to be fed which control the brakes. For Brake Step 3 to be obtained both 10 and 11 wires must be de-energised. The extraneous washer provided a feed from 13 wire to 11 wire so that Steps 2 and 3 could not be obtained as 11 wire remained live. In the Emergency brake position 10 and 11 wires are earthed so that any extraneous feeds are overcome.
- 29 Should the train part, 13 wire is broken and the feed to 10 and 11 wires is lost, causing a Step 3 brake application.
- 30 A control table is given below together with an indication of the actual state of 11 wire with the washer present and the resulting brake application achieved:

Brake Step Demanded	Wire 10 as Designed	Wire 11 as Designed	Wire 11 under Fault Condition	Result under Fault Condition
Release	Live	Live	Live	Release
Step 1	Dead	Live	Live	Step 1
Step 2	Live	Dead	False live	Release
Step 3	Dead	Dead	False live	Step 1
Emergency	Earthed	Earthed	Earthed	Emergency

Conclusions

- 31 The immediate cause of the accident was the presence of an extraneous washer in a drumswitch of unit 319004 causing an electrical defect preventing the application of Brake Steps 2 and 3 (paragraph 14).
- 32 A contributing factor was the difficulty in examining the front section of the drumswitch where the defect occurred which may have led to the presence of the washer being missed (paragraph 22 and Recommendation 1).
- 33 The means by which the train was recovered to the Depot for investigation and repair did not impose an increased risk to the safe operation of the railway.

Actions already taken or in progress

- 34 Thameslink re-issued written instructions for the Drumswitch Examination to their maintenance staff with effect from 24 February 2006 requiring the use of ‘an inspection mirror to check any areas that are not in line of sight, to identify any foreign items.’ Any item found in the drumswitch is to be reported to the Supervisor so that the source can be established.
- 35 Southern re-issued their maintenance instructions to require an inspection mirror to be used when examining the interior of the drumswitch on 7 March 2006 to both the inspection shed and repair shop at Selhurst.
- 36 Southern have advised the class 319 owner’s site representative at Wolverton of the need to ensure that no loose material is left in the drumswitches following attention.

Recommendations

37 Implementation of the recommendations below is the responsibility of the organisations identified in each one. When they have considered the recommendations, the organisations should establish a priority and timescale for the necessary work, taking into account their health and safety responsibilities and the risk profile of their activities.

1. First Capital Connect (formerly Thameslink) and Southern should arrange for an inspection mirror to be used when examining the interior of the drumswitch. This recommendation has already been implemented (paragraphs 31, 32, 34 and 35).
2. Alstom to review procedures, processes and equipment in order to identify an effective means of preventing loose material from interfering with the operation of the drumswitch (paragraphs 24, 25 and 31).

Appendices

Glossary of abbreviations and acronyms

TOC

Appendix A

Train Operating Company

Glossary of terms

Appendix B

Drumswitch	An electrical switch at the outer ends of a multiple unit enabling the electrical connections to be coupled and uncoupled from another unit.
Electrical Bypass Switch	A switch enabling the brake wire detecting the complete continuity of the train to be by-passed to isolate defects and enable the train to be moved safely.
Master Switch	A switch operated by the driver to activate the cab to be used and select the direction of travel.
Multiple Unit	A set of semi-permanently coupled vehicles capable of moving under their own power and controlling one or more other units coupled to it.

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